SCIENCE LEARNING: THE CANADIAN CONTEXT

1999

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SAIP

School Achievement Indicators Program

1999

Council of Ministers of Education, Canada

The Council of Ministers of Education, Canada (CMEC), created in 1967, provides the ministers responsible for education in the provinces and territories with a mechanism for consultation on educational matters of mutual interest and concern and facilitates cooperation among the provinces and territories on a broad range of activities at the elementary, secondary, and postsecondary levels. CMEC Secretariat offices are located in Toronto.

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Council of Ministers of Education, Canada
95 St. Clair Avenue West, Suite 1106
Toronto, Ontario M4V 1N6

Telephone: (416) 962-8100
Fax: (416) 962-2800
E-mail: cmec@cmec.ca

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School Achievement Indicators Program (SAIP)

Canadians, like citizens of many other countries, want their children to have the best educational preparation possible. Consequently, they are asking how well our educational systems prepare students for lifelong learning and for participation in the global economy.

To help answer this question, ministries[1] of education have participated in a variety of studies since the mid-eighties. At the international level, through the Council of Ministers of Education, Canada (CMEC), Canadian provinces and territories took part in the International Educational Indicators Program of the Organisation for Economic Co-operation and Development (OECD). Individual jurisdictions participated in various achievement studies, such as those of the International Assessment of Educational Progress (IAEP) and the International Association for the Evaluation of Educational Achievement (IEA). Typical of international studies are the Third International Mathematics and Science Study (TIMSS) in 1995 and its replication in 1999 — and the OECD Program for International Student Assessment (PISA), to be administered in 2000. In addition, in most jurisdictions, ministries undertook or enhanced measures at the jurisdictional level to assess students at different stages of their schooling.

Since all ministers of education wish to bring the highest degree of effectiveness and quality to their systems, they have long recognized a need for collective action to assess these systems. They acknowledge that achievement in school subjects is generally considered to be one worthwhile indicator of the performance of an education system. In particular, the ministers wanted to answer as clearly as possible the question: "How well are our students doing in mathematics, reading and writing, and science?"

In that context, in 1989, CMEC initiated the School Achievement Indicators Program (SAIP). It was a first-ever attempt by the ministers of education of all provinces and territories to arrive at a consensus on the elements of a national assessment. In December 1991, in a memorandum of understanding, the ministers agreed to assess the achievement of 13- and 16-year-olds in reading, writing, and mathematics. In September 1993, the ministers further agreed to include the assessment of science. They decided to administer the same assessment instruments to the two age groups to study the change in student knowledge and skills resulting from the additional years of instruction. The information collected through the SAIP assessments would be used by each jurisdiction to set educational priorities and plan program improvements.

The first cycle of assessments took place as scheduled, and the reports were published in December 1993, December 1994, and January 1997, respectively. The second cycle has also proceeded as scheduled, with the second science assessment administered in the spring of 1999. Achievement results for the 1999 science assessment have been presented in a public report[2] released in spring 2000. This report is a companion to the achievement report and presents the results of a major enhancement of SAIP, designed to provide much more comprehensive information on the context of science learning than was available in previous assessments.

The 1999 Enhancement of SAIP Science

Learning is a complex process, affected by many factors within student background and experience, school and classroom conditions, resources, motivation, quality of schooling and teaching, attitudes, and expectations. SAIP had originally been thought of as a comprehensive indicators program, through which data would be gathered on many of the factors that might influence learning. Earlier SAIP assessments had included student questionnaires, which gathered some data on student backgrounds and activities. However, little use was made of this information other than the inclusion of brief summaries as supplements to the main achievement reports.

In September 1998, CMEC approved a proposal to enhance SAIP through the administration of comprehensive school, teacher, and student questionnaires. All students completing the achievement tests were also asked to complete a questionnaire. In addition, teachers identified as teaching science to the sampled students, along with the principals of all sampled schools, were asked to complete questionnaires. As well as student backgrounds and activities, the questionnaires included items about school characteristics, decision making, resources, classroom practices, opportunity to learn, attitudes toward school and science, and teacher backgrounds and specialization.

[1] In this report, "ministry" means "department" as well, and "jurisdiction means both "province" and "territory."

[2] SAIP Science, 1999. Toronto: Council of Ministers of Education, Canada

Sampling and Sampling Error

In April and May 1999, the science assessment — both tests and questionnaires — was administered to a random sample of students drawn from all provinces and territories. A total of 18 different populations were used, representing all of the provinces and territories. Separate English and French populations were also identified in the provinces of Manitoba, Ontario, Quebec, New Brunswick, and Nova Scotia. The sampling scheme was designed to yield representative samples of students of sufficient size to permit separate reporting for each population. Approximately 31,000 students made up the total sample: 16,000 thirteen-year-olds and 15,000 sixteen-year-olds. About 22,500 students completed the science assessment in English, and 8,500 in French. For some provinces and territories, where the total number of students was small, the whole age-group population was selected.

It is important to note that the sampling procedure was designed to yield a representative sample of students in each of the 18 population groups identified. For large jurisdictions an initial random sample of schools was selected, and for smaller jurisdictions all schools having students in the relevant age groups were selected. The sample of schools can therefore be said to be representative in all jurisdictions. The school questionnaires were completed by the principals of all schools taking part in the assessment — a total of just over 2,000 schools.

The teacher questionnaire sample was derived from the student sampling scheme. The teacher sample was defined as all teachers who taught science in the 1998–99 school year to any of the students completing the assessment. However, it was not possible to determine definitively if all possible teachers had been identified. It is therefore not possible to make a definitive statement concerning the representativeness of the teacher sample. Nevertheless, the large sample size of 6,500 teachers nationally, or one for every five students, makes it unlikely that any serious bias exists in that sample.

Most of the results presented here are in the form of percentages responding to a particular category or combination of categories. Because the responses are based on samples, they are only estimates of the responses that would have been received had all members of the relevant populations been surveyed. It is common practice in survey research to give a range, known as a confidence interval, within which the actual population value should fall 95% of the time. The width of the confidence interval is typically related to the sample size and whether the response is near the middle or at the extremes of the scale (e.g., responses near 10% or 90% have smaller errors than those near 50%). The confidence interval is related to population size only if the population is relatively small. The confidence interval is zero if all members of the population have been sampled.

Confidence intervals are not reported here because this adds substantially to the complexity of the graphical presentations. Nevertheless, it is important to avoid inferring that "real" differences exist between groups when observed differences are within the expected confidence interval. Comparisons in this report have therefore been made with reference to a table of confidence intervals applicable to different sample sizes and percentage responses. In practice, the difference required for policy or practical importance is in most cases much larger than the width of the typical confidence interval. Readers are cautioned not to attach much significance to observed differences less than plus or minus 10%. In almost all cases, the differences highlighted here are much larger than this.

Purpose and Structure of This Report

The ultimate goal of questionnaire analysis is to link the responses to the three questionnaires with the achievement levels of students, in order to examine in detail how contextual factors are related to achievement. In this report, however, the results are presented mainly in descriptive/comparative form, with a view to presenting a snapshot of students, teachers, and schools in Canada and in the separate populations used by SAIP. It is hoped that this will serve to stimulate discussion about important features of our schools, teachers, and students — and to generate the more complex analyses required to indicate what factors are more or less closely associated with science achievement.

The report is divided into five sections. The first gives an outline of the conceptual framework for the questionnaires, the developmental procedures, and the questionnaire specifications. The next three sections report on the detailed responses to the questionnaires by principals, teachers, and students, respectively. Finally, a summary section identifies some of the highlights of the results and gives a number of suggestions for further research.

The results are presented mainly in the form of bar charts, with separate bars for each population. This is done to allow readers to see the results for their own province, territory, or language group. In examining these results, the cautions already given about sampling error should be kept in mind.

FRAMEWORK FOR THE QUESTIONNAIRES

***Conceptual Framework*[3]**

It is obvious that learning is a complex process and that the achievement of an individual student or group of students is influenced by an enormous number of variables. While some of the important influences on achievement are related to ability and socioeconomic status, which are beyond the control of the school, it is also generally acknowledged that variations in educational policies and practices can also influence learning. Some of the variables affecting learning would be expected to be more important for policy, more amenable to change, or more efficient as ways of enhancing learning than others. Improving learning can be expected to require intervention at the individual student, classroom, school, or jurisdictional level. Some ways of improving learning might require enormous outlays of resources while others might be accomplished relatively easily.

Most educational indicator systems are built around the fairly straightforward concept that student learning **outcomes** are influenced by **inputs** and by the **processes** engendered by these inputs. It is also generally recognized that education operates in an overall **context** determined by demographic features, social and economic conditions, infrastructure, and other broad characteristics of the society in which the enterprise operates. This type of model is depicted in Figure 1.

Context

Inputs → Processes → Outcomes

Figure 1
Input-Process-Outcome Model in Context

While outcomes are clearly defined in a program such as SAIP as the results on the achievement measures, the model, in itself, does not tell us what specific context, input, or process variables are most worth investigating. Some elaboration of the model is required if it is to be of any use in determining what variables should be included in studies of the factors influencing achievement. Most of the variables included in comprehensive surveys have some plausible basis in previous research, or may be justified by their policy relevance.

Perhaps the best example of this is the synthesis work of Herbert Walberg and his colleagues, which has taken place over more than a decade, and which has appeared in the literature in various forms. The particular version to be discussed here appears in three major articles by Wang, Haertel, and Walberg (1990, 1993, 1994).

In their 1993 paper, Wang, Haertel, and Walberg synthesized the results of more than 200 research reviews, encompassing thousands of individual studies. They identified 228 variables shown to be associated with learning. These in turn were organized into 30 scales, under six broad categories on a proximal/distal continuum based on how closely the variable touched on the lives of teachers and students in the classroom. For example, broad state and school district policies were considered the most distal variables, while time on task, discipline, and other classroom variables were considered most proximal.

In general, the results supported the hypothesis that proximal variables are more closely associated with learning than more distal variables. The order of influence of the six main categories was

1. Program Design (e.g., curriculum and instruction)
2. Out-of-School Contextual Variables (e.g., home environment, out-of-school use of time)
3. Classroom Instruction and Climate (e.g., classroom management)
4. Student Variables (e.g., motivation, placement)
5. School-Level Variables (e.g., parent involvement policy)
6. State and District Variables (e.g., state-level policy)

An initial table of specifications for the questionnaires was developed from the Wang, Haertel, and Walberg synthesis, an initial analysis of policy issues in the Canadian context, and an examination of the frameworks for several other large-scale studies. This table was organized along the lines of the six main categories of the Wang, Haertel, and Walberg synthesis, plus a "teacher" level, which captures certain policy-relevant issues, such as teacher qualifications, which are present in other formulations but absent as a main category in Wang, Haertel, and Walberg. The main categories and second level sub-categories are given in the appendix.

[3] A detailed version of the Conceptual Framework can be found in the appendix.

Development Procedures

The initial draft of the three questionnaires was produced directly from the table of specifications. Many items were adapted from previous studies. Other items were constructed specifically to fit the table of specifications. This draft was reviewed in detail by the members of the SAIP developmental consortium. The draft teacher questionnaire was also reviewed by approximately 20 teachers. The draft student questionnaire was subjected to a field trial in one province, using 24 classes with a total of 535 students.

All of the information from the reviews and field trials was used to produce a second draft. After one further review by the developmental consortium, the new draft was submitted to the various jurisdictions, through the SAIP coordinators in each jurisdiction. Because of the fairly high demands placed on teachers, both in administering the tests and in completing the questionnaires, it was also judged desirable to consult the Canadian Teachers' Federation (CTF). Detailed written submissions were received from a number of provinces and from CTF. Personnel from other jurisdictions had an opportunity to react in a conference call on March 5, 1999, during which an item-by-item review of all three questionnaires was conducted.

These reviews resulted in extensive modifications to the questionnaires. The most significant changes involved reducing the number of items on student socioeconomic status and family circumstances, teacher background, and school climate. Nevertheless, core items on student socioeconomic status (parents' education and occupations) and on teacher qualifications and experience were retained. Items on the school questionnaire on behaviour problems were removed. However, it was possible to retain more general items on school climate, such as levels of responsibility for various activities, the role of parents, and the existence of policies governing discipline, homework, and similar matters.

The school questionnaire was completed by the principal. It contained 32 items covering school demographics and student characteristics, policies on matters such as school improvement, collaboration, student evaluation, homework, absenteeism, locus of decision making and sources of influence on the school, factors limiting the school's capacity to provide instruction, computers and their use, course organization, streaming, remediation, and enrichment. The questionnaire also asked principals for their opinions on a range of issues related to factors affecting student learning, school spirit and morale, and support for the school.

School Demographics

Principals were asked to describe the type of community in which their school was located by selecting from one of six categories. **Chart 1** shows the results for the two smallest types (rural, small town) and the two largest types (medium or large city). As expected, a general East-Central-West division is apparent here, with many more schools in the East (and North) located in rural or small-town areas than in the Central or Western provinces, while in Ontario and Quebec, there are fewer rural/small-town schools than in other provinces, either Eastern or Western.

Chart 2 shows median school sizes. The most obvious feature here consists of the extreme differences between schools in the Ontario English and Quebec French populations and the British Columbia population — and those elsewhere. Interestingly, while the Ontario English and French school sizes follow the general demographics of the schools themselves (more rural and small-town schools and smaller median school size in the French population), Quebec schools show the opposite pattern, with English schools tending to be smaller than their French counterparts, despite more of them being located in urban areas.

Schools are almost universally administered through school boards or districts. **Chart 3** shows district sizes for schools in the SAIP sample. This chart shows even greater extremes than the school-size chart, but with a pattern that is not particularly closely linked to provincial population. For example, Nova Scotia has the largest school districts outside of Ontario English, and districts in Manitoba, Saskatchewan, and Alberta are smaller than those in the Atlantic provinces. This pattern likely reflects school district consolidation policies implemented in many provinces in recent years.

An indication of the prevalence of community-based, rather than consolidated, schools is given by the percentage of students who live within walking distance of their school, as shown in **Chart 4**. A unique pattern occurs here for the territories, where the majority of the population resides in towns or small communities dispersed across large geographic areas, often without road access. Historically, high school students from small communities attended consolidated residential schools. Over the past decade, grade extensions have been implemented to permit most students to complete their K-12 education in a community-based school. Beyond this, an East-West division is again apparent, with Western provinces having more students walking to school than Eastern provinces. This is likely linked in a complex way to school size and the proportion of rural and urban schools in a province.

Student Characteristics

Chart 5 shows the median percentage of students reported as having a first language other than the language of the school. Aside from the extreme represented by Nunavut, the most interesting feature here is the relatively high proportions in most of the francophone populations outside Quebec and in the anglophone population in Quebec. One possible explanation for this is that schools of the minority language group may be attracting students of the majority language, possibly as a route to immersion in the minority language. This seems more likely, however, for francophone schools in other provinces than for anglophone schools in Quebec.

The median percentage of students reported as requiring special attention is given in **Chart 6**. Here the three territories are distinguished by having much higher proportions of such students than others. Beyond this, the data are notable for reasonable consistency, at near the 10% level, across jurisdictions.

Class Size

Principals were asked to estimate average class sizes in their school as a whole and in science classes at the two SAIP age levels. This allows us to examine the question of whether science classes are comparable in size to other classes in the school. **Chart 7** gives the percentage of classes with 25 or more students for the three categories. While the differences are generally not large, there is a slight tendency in most provinces for science classes for 16 year-olds to be smaller than either those for students aged 13 or those for the school as a whole. The between-province differences are substantially larger, with Quebec French schools standing out as having the most schools reporting classes over 25 in all categories.

School Policies and Decision Making

Principals were asked to indicate whether or not their schools have active school-improvement teams and plans, policies to recognize teacher excellence, regular staff meetings, written policies on evaluation, discipline, absenteeism, and homework. For most of these categories, a large majority of principals (typically 70%–90%) gave positive responses. The notable exceptions were homework policies (where somewhat fewer schools had such policies and greater provincial differences were found) and recognition of teacher excellence (where relatively few schools in any jurisdiction reported having such a policy).

The locus of decision making was the subject of a series of questions in which principals were asked to identify the level at which decisions are made or at which influence is exerted on these decisions. Here, the most interesting point of contrast is between within-school and external decision making, as this is a measure of school autonomy. Wide differences between jurisdictions were identified for a number of important areas of decision making. Because of the complexity of the data, only a selection of results is presented here.

Chart 8 shows the relative and cumulative influence of the school district and the principal on teacher hiring decisions. It is clear that in most jurisdictions, these two sources account for most of the decisions about hiring. Keeping in mind that these are the perceptions of principals, the obvious point of contrast between jurisdictions is on the internal-external dimension: in some cases most of the decision making is at the district level, while in others it is at the principal level.

A second important area of decision making lies in the choice of textbooks. **Chart 9** shows the influence of province and district. (Remaining sources of influence, up to the 100% total, may be taken as internal to the school.) Here again, the obvious contrast is between within-school and external decision making, with widely differing total external influence being found across jurisdictions. In particular, there is a general East-West division here, with external influence much more prevalent in the Atlantic provinces and in the Yukon than elsewhere. This is mainly due to differences in provincial influence. Clearly, the Atlantic provinces and the Yukon have much more centralized textbook decision making than other jurisdictions. At the opposite extreme is Quebec French, where very few principals perceived that textbook decisions are made outside the school.

For most other areas, such as discipline, absenteeism, community relationships, contact with parents, and courses offered, decision making was reported as being done primarily within the school and, more specifically, by the principal. A notable exception, again, was the Quebec francophone population, where school councils were generally reported as having greater influence than elsewhere. Also, determining course content was generally reported as a provincial responsibility, again with Quebec French principals more often reporting greater influence of school councils.

Much can be learned about decision making by examining who controls various components of the school budget. Again, because of the large number of separate items, only a general summary will be presented — showing that there are sharp contrasts in locus of control between jurisdictions and between specific budget items.

1. Teacher salaries are almost universally controlled outside the school. Responses indicated either overwhelming provincial or equally overwhelming district control. Presumably, this does not vary from school to school within a province, and is dependent on whether collective bargaining is conducted at the provincial or the district level.
2. In most cases, capital expenditures were reported as being controlled by the district, as was the case for maintenance expenditures. Again, Quebec francophone schools were exceptional in reporting greater responsibility on the part of the principal.
3. Salaries of non-teaching staff were generally reported as being a district responsibility. The exceptions here were Quebec, Prince Edward Island, New Brunswick, and the Yukon, where this was seen by most as a provincial responsibility.
4. Responsibility for materials and supplies, including instructional materials and new technologies, varied among jurisdictions between districts and principals. The latter item was seen more often as a provincial responsibility in Prince Edward Island and the territories.

Locus of influence was examined in a different way in a series of questions about how much influence various organizations, groups, and individuals have on the school's overall program and activities. Generally speaking, the provincial or territorial ministry, the school board, the principal, teachers collectively, and individual teachers were all almost universally perceived as having some or a lot of influence. Beyond this, a more mixed picture emerged. For example, while

principals in most jurisdictions widely reported that parent advisory committees or school councils have some influence, these bodies were much more rarely seen as having "a lot of" influence compared to the previous groups. Similarly, students were not often seen as having a lot of influence, nor were textbook publishers, external committees, professional associations, the business community, or the Church or other religious groups.

A number of specific questions were asked about the level of parental involvement in various aspects of the life of the school. Relatively low levels of involvement, with substantial variation across jurisdictions, were found on such matters as volunteering in classrooms, monitoring student behaviour, and serving on committees. Somewhat higher, but also quite variable, levels of involvement were found for decisions on selection of the principal and teachers, despite other information suggesting that parents are not the primary sources of influence in these decisions. The areas in which very high levels of parent involvement were found were interaction with staff on matters affecting their own children and fundraising. On the latter, notable exceptions were found for Quebec francophone schools and those in the territories, where reported levels of involvement were much lower.

Because of the emphasis in recent years on accountability and the implementation of public examinations and other forms of provincial testing, along with SAIP and various international testing programs, it is worth looking in more detail at the influence of external examinations, tests, or standards on school programs. The percentage of principals reporting "some" or "a lot" of influence from this source is given in **Chart 10**. This chart shows considerable variation across jurisdictions, with relatively little influence being shown in Saskatchewan, Nova Scotia, and Prince Edward Island and strong influence in Alberta, Manitoba, Quebec, and New Brunswick English. Other than in New Brunswick, there seems to be little difference in the views of francophone and anglophone schools within provinces in this case.

Factors Limiting Ability to Provide Instruction

Two sets of questions were asked on this issue. The first was concerned with external factors such as parental support, student backgrounds, and community conditions; the second, with school resources and facilities.

Chart 11 shows the percentages of principals reporting that community conditions and lack of parental support are limiting factors. There is an obvious pattern of greater concern with these two factors on the part of the francophone and territorial populations. A similar pattern is found for student ability and home background, as shown in **Chart 12**. In this case, however, all jurisdictions appear to see student factors as more limiting than parent and community factors.

Two questions were asked about the effects of bussing students: one on the degree to which it restricts the school schedule and the second on whether it limits instruction. Percentages reporting substantial or severe scheduling restrictions and some or a lot of instructional limits are given in **Chart 13**. The general pattern is one of greater restriction of schedule than of limitation of instruction. Bussing is not as great a problem in Nunavut, the Northwest Territories, and Saskatchewan as elsewhere — a pattern which is consistent with the actual prevalence of children walking to school as indicated earlier (Chart 4).

Chart 14 shows the percentage of principals indicating that instruction in their schools is limited by a shortage of teachers specialized in science and other specialists such as guidance counsellors. In general, lack of other specialists appears to be more of an inhibiting factor than lack of science specialists. Substantial variations are found across jurisdictions on both factors, with Quebec French schools appearing less limited and schools in Nunavut, the Northwest Territories, and New Brunswick English standing out at the opposite extreme.

Availability of instructional materials and supplies, as well as the condition of the building and the availability of instructional space are further indicators of resources available to the school. **Chart 15** shows the degree to which principals perceive their instructional program to be limited by the first pair and **Chart 16**, by the second pair of these factors. Again, there are substantial variations across jurisdictions, with Quebec principals (both English and French) and those in the Yukon reporting limitations less often than others. Generally, the condition of building and instructional space are less limiting than either materials and supplies or shortage of specialist teachers.

Finally, **Chart 17** shows the effects of two conditions specific to science teaching — namely, laboratory space and equipment. Again, there are substantial variations across jurisdictions, with schools in Quebec and the Yukon reporting limitations less often than others. Generally speaking, the two bars within a jurisdiction are close together, suggesting that lack of space and equipment are correlated.

Computers and Their Use

Chart 18 shows the median number of computers per school and the number judged by principals as being capable of running up-to-date software. It is important to note that the absolute number of computers is strongly related to school size, so that differences between provinces in this case reflect relative school sizes more than computer availability. The important point here is the difference between total computers and up-to-date computers (defined as those capable of running Windows™-based programs and Web browsers) because this is an indicator of how well schools have been able to keep their computers current. In most cases, this gap is fairly small relative to total computers, and does not vary dramatically by province.

An important issue for policy and practice is the availability of computers for instructional purposes The number of computers available for teacher instructional use and student class use is shown in **Chart 19**. The important point to note here is that there is a consistent gap between the total number of computers and the number available for instructional purposes, as indicated by the difference between Charts 18 and 19. In addition, it is clear that in some jurisdictions more than others, computers are more readily available to students than to teachers. This pattern is most apparent in Quebec French and British Columbia schools.

Chart 20 gives the views of principals as to whether the school's capacity to provide instruction is limited by a shortage of computers. Here the percentages are consistently higher than for most other limiting factors examined, but with a similar pattern of fewer schools in Quebec and the territories reporting limitations. In almost all jurisdictions, shortage of computers is seen as a more limiting factor in science instruction than in instruction in general.

In a final set of questions on computers, principals were asked to indicate the particular configuration in which computers can be found in their schools. Items were included on dedicated computer rooms and computers in classrooms, resource centres and teacher workspaces. A large majority of principals in most jurisdictions reported that their schools have dedicated computer laboratories where science classes can be scheduled. Most principals also reported that computers are available for student use in the school library or resource centre. The proportion reporting a computer in science classrooms and in science-teacher work areas was quite variable across jurisdictions, as indicated in **Chart 21**.

Time

The length of the school year is generally a matter of provincial legislation. All schools within a jurisdiction would therefore be expected to report the same value for the number of instructional days in the school year. In most cases, there was a strong modal value (the value reported by the largest number of schools), indicating that schools typically reported the statutory value. The question was asked separately for the 13-year and 16-year age groups, but no differences in responses were observed. The modal figures are reported in **Chart 22**. This chart shows that most school years are close to 190 days, with variations from about 180 to 200.

Despite the clear modes in most cases, considerable variation across schools was found in some jurisdictions. This suggests the possibility of some ambiguity in the question or in principals' interpretations of the actual requirement. The following points may be made about these variations:

1. Although British Columbia had a clear mode, some schools also reported 186, 190, and 192 days.
2. The mode for Alberta was less clear, with multiple schools reporting in the range of between 185 and 190.
3. Values of 187 and 190 were also reported by some schools in Saskatchewan.
4. The Manitoba English distribution was almost bimodal, with 200 days being reported by almost as many schools as 190 days. Manitoba French had a clearer mode, at 200 days.
5. Ontario schools tended to report either 190 or 194 days, with 190 as a clear modal value.
6. In addition to the mode of 187, a number of Newfoundland and Labrador schools reported either 185 or 190.

The number of teacher activity days by jurisdiction is given in **Chart 23**. Again, because this is usually characteristic of a province rather than a school (because of regulations or collective agreements), strong modes were observed, with fewer variations than for the school year as a whole. What is obvious here is the variation across jurisdictions. In this case, Quebec again stands out, with its 20 days being double that of any other province.

Part of the explanation for variations in reporting of the school year may actually lie in whether or not principals counted professional development days. This is especially noticeable in Manitoba and Ontario, where the second-most-

frequently-reported length of school year corresponds to the mode less the number of professional development days.

Principals' estimates of the number of days lost due to the school being closed are shown in **Chart 24**. In general, only a small number of days was reported lost, with a pattern of Eastern provinces showing more lost days than others.

The length of the school day was almost universally reported as five hours. The exceptions were Nunavut, the Northwest Territories, and Manitoba English (where the modal value was six hours) and Alberta, Manitoba French, and New Brunswick (with close to bimodal distributions, at five and six hours).

Course Configurations

Principals were asked about whether the courses in their schools are semesterized, how many different science courses are available, whether students follow the same or different courses, whether the school is organized in streams or ability groups, and who influences student decisions as to what courses they should take.

Little semesterization of courses is evident for the 13-year age group. At the 16-year-old level, a high degree of semesterization is characteristic of most provinces. The exceptions are Quebec English and French and Newfoundland and Labrador, where there is almost no semesterization.

Almost all jurisdictions reported that only one science course is available for 13-year- olds, reflecting the common nature of the program at this level. The median number of courses available for 16-year-olds varied from two to five by province. However, the data were more notable for the variation within provinces than for the between-province differences. It is likely that these variations are as much a function of school size as of provincial policies because upper secondary programs tend to be characterized by a proliferation of courses, especially in large schools. The data also support the obvious conclusion from this that essentially all 13-year-olds take the same science course, while 16-year-olds may select from a variety of courses.

For 13-year-olds, about 75% of schools in most jurisdictions reported having a single stream, with the figures being slightly lower for Nunavut and the Northwest Territories and higher for New Brunswick. The picture changes significantly for the 16-year level, as shown in **Chart 25**. The most obvious feature of this chart is that streaming is strongly associated with jurisdiction, with the proportion of single-stream schools in particular varying substantially across jurisdictions. Variations in the percentages of two-stream schools are somewhat smaller. The space to the right of the bars up to 100% indicates the percentage of schools with three or more streams. The pattern here seems to be that provinces with few single stream schools also have more schools with three or more streams.

In general, principals reported that, where more than one course is available, general academic ability, previous science achievement, the wishes of students and their parents, and, to a lesser degree, teacher recommendations are all strong sources of influence on course choice. Entrance examinations and interviews or oral examinations have only minimal influence.

The percentage of schools reporting that they provide remedial teaching and enrichment programs in science is given in **Chart 26**. Again, we see substantial differences between jurisdictions, with smaller jurisdictions tending to have fewer of these programs — a notable exception being remedial teaching in the Yukon. In addition, there is some tendency for more schools to report remedial than enrichment activities. Responses to questions about the specific ways in which such programs were organized showed no dominant pattern, with relatively small proportions of schools reporting each of the following: grouping within classes, withdrawal from regular classes, separate or modified courses, extra work outside regular school hours, and programs outside the school.

Views on School Learning and Support for the School

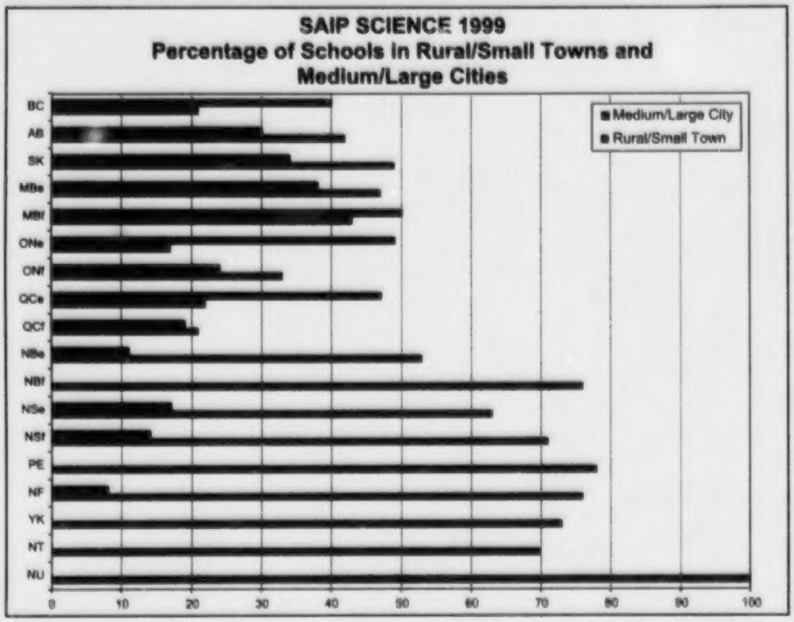
Principals were asked a number of questions about their views on factors influencing student learning, whether or not high school students should be streamed, and the state of staff morale and support for the school.

There was almost universal agreement that students can achieve at high levels if they work hard, a result which closely matches that found for teachers. There was also strong agreement throughout that student ability has a large influence on achievement and that there are limits to what a school can accomplish because home background has a large influence on achievement.

Responses to the streaming question appear in **Chart 27**, with "strongly agree" and "agree" responses combined. The pattern here is one of general support for the proposition that high school students should be streamed on the basis of abilities. However, there are greater variations across jurisdictions here than for teacher responses to the same question. Principals in British Columbia, Saskatchewan, and Nova Scotia French are fairly evenly divided on the issue, with around 50% agreement. All others show 60% or greater agreement, with this extending to more than 80% in some jurisdictions.

Chart 1

In what type of community, town, or city is your school located?

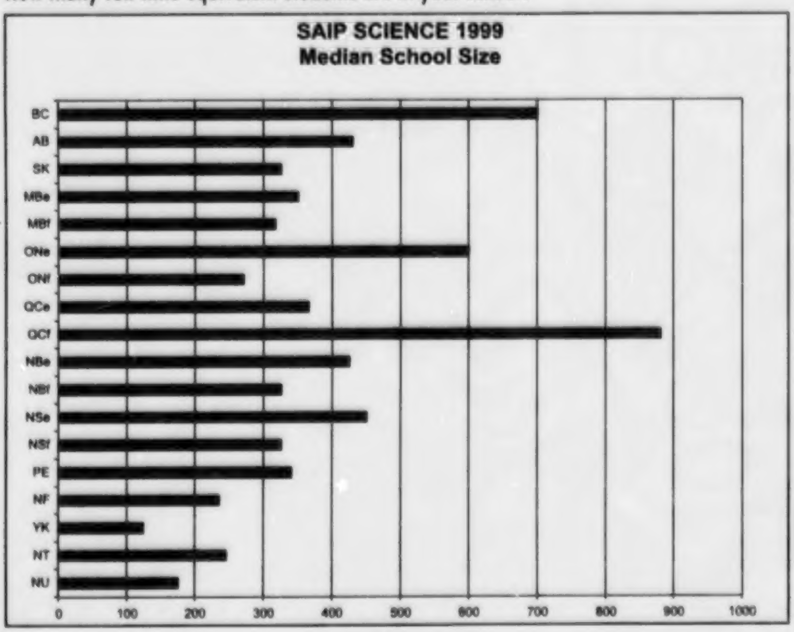


Type of community

	Medium/Large City %	*Rural/Small Town* %
BC	40	21
AB	30	42
SK	34	49
MBe	38	47
MBf	50	43
ONe	49	17
ONf	24	33
QCe	47	22
QCf	19	21
NBe	11	53
NBf	0	76
NSe	17	63
NSf	14	71
PE	0	78
NF	8	76
YK	0	73
NT	0	70
NU	0	100

Chart 2

How many full-time equivalent students are in your school?

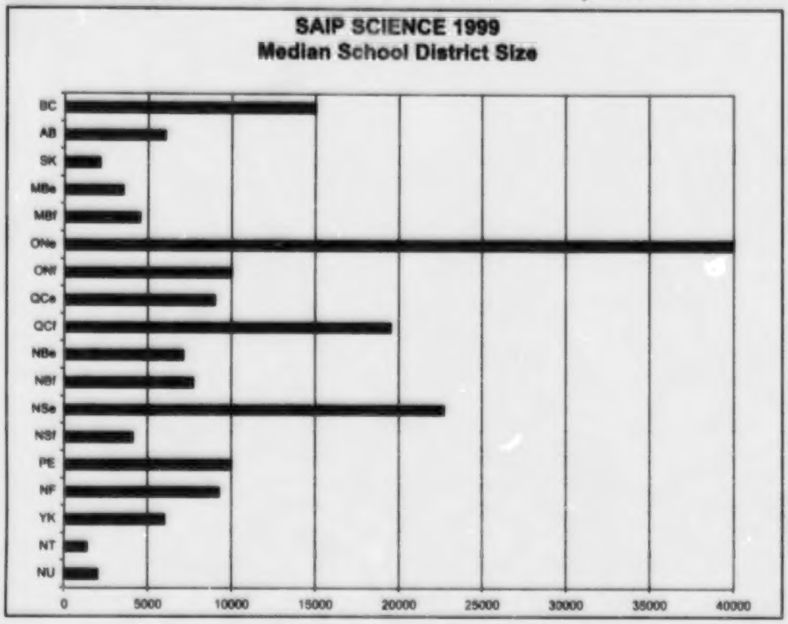


Number of FTE students

	(Median)
BC	700
AB	430
SK	325
MBe	350
MBf	317
ONe	600
ONf	270
QCe	365
QCf	880
NBe	425
NBf	325
NSe	450
NSf	325
PE	340
NF	235
YK	124
NT	245
NU	175

Chart 3

If your school is part of a larger school board or district, how many students are in the board or district?

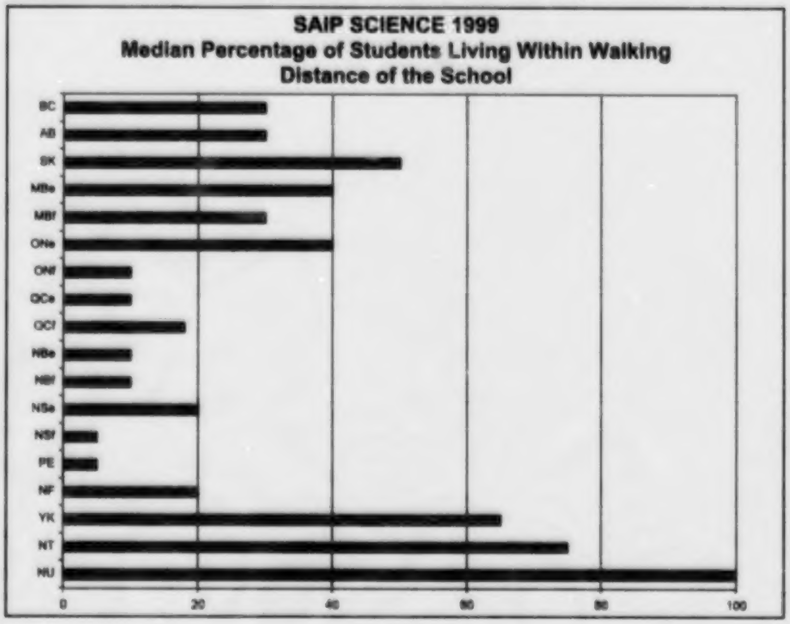


Total number of students

	(Median)
BC	15000
AB	6000
SK	2100
MBe	3500
MBf	4500
ONe	40000
ONf	10000
QCe	9000
QCf	19500
NBe	7120
NBf	7725
NSe	22700
NSf	4100
PE	10000
NF	9260
YK	6000
NT	1370
NU	2000

Chart 4

Approximately what percentage of students in your school would you estimate live within walking distance (about 1 km) of the school?

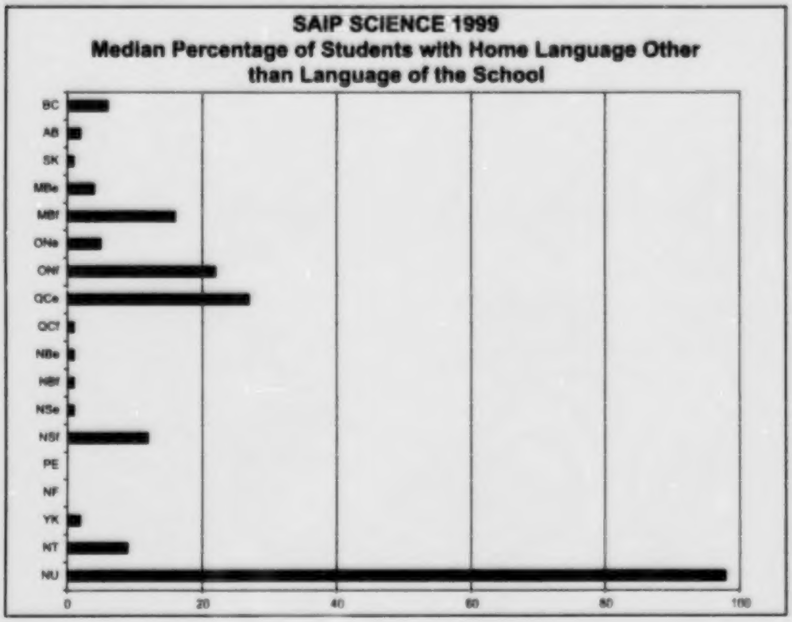


Within walking distance

	%
BC	30
AB	30
SK	50
MBe	40
MBf	30
ONe	40
ONf	10
QCe	10
QCf	18
NBe	10
NBf	10
NSe	20
NSf	5
PE	5
NF	20
YK	65
NT	75
NU	100

Chart 5

Approximately what percentage of students in your school would you estimate have a first language other than the language of the school?

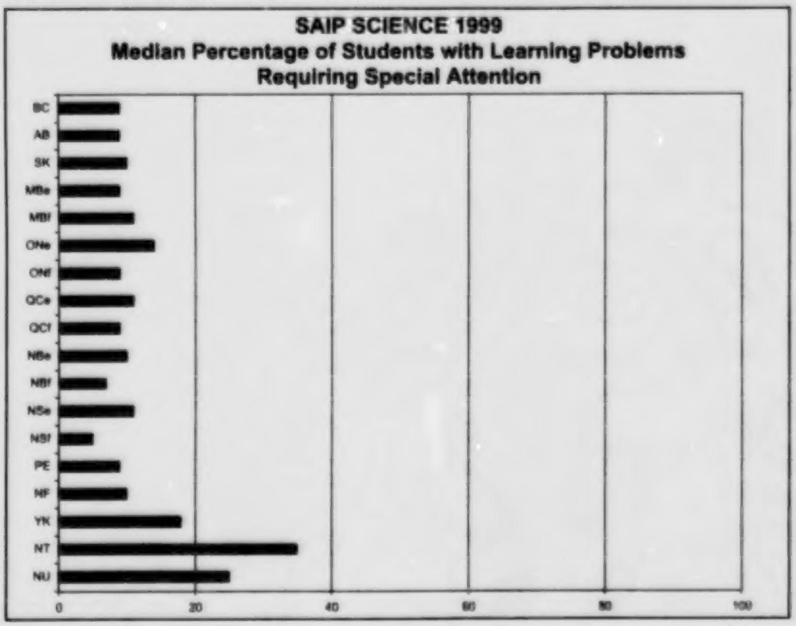


Other language

	%
BC	6
AB	2
SK	1
MBe	4
MBf	16
ONe	5
ONf	22
QCe	27
QCf	1
NBe	1
NBf	1
NSe	1
NSf	12
PE	0
NF	0
YK	2
NT	9
NU	98

Chart 6

Approximately what percentage of students in your school would you estimate have learning problems that need special attention?

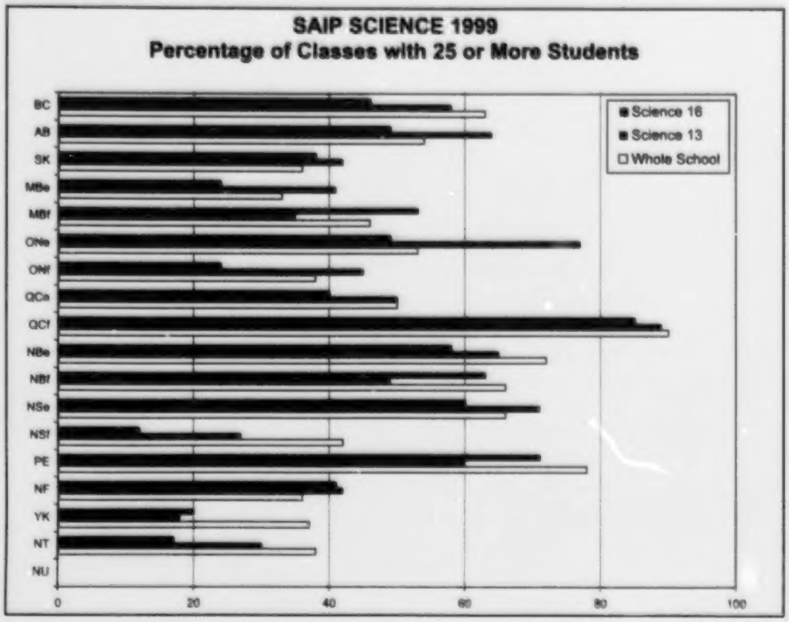


Special needs

	%
BC	9
AB	9
SK	10
MBe	9
MBf	11
ONe	14
ONf	9
QCe	11
QCf	9
NBe	10
NBf	7
NSe	11
NSf	5
PE	9
NF	10
YK	18
NT	35
NU	25

Chart 7

What is the approximate average class size in your school as a whole and in the science classes for the two SAIP age groups?

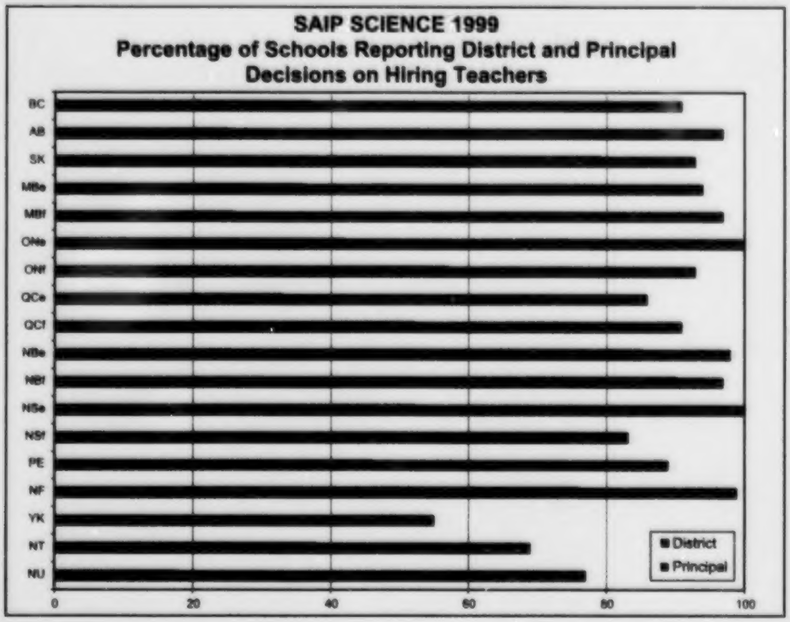


Percentage of classes with 25+ students

	Science 16	*Science 13*	*Whole School*
BC	46	58	63
AB	49	64	54
SK	38	42	36
MBe	24	41	33
MBf	53	35	46
ONe	49	77	53
ONf	24	45	38
QCe	40	50	50
QCf	85	89	90
NBe	58	65	72
NBf	63	49	66
NSe	60	71	66
NSf	12	27	42
PE	71	60	78
NF	41	42	36
YK	20	18	37
NT	17	30	38
NU	0	0	0

Chart 8

In your school, which level has the most influence on decisions regarding the hiring of teachers?

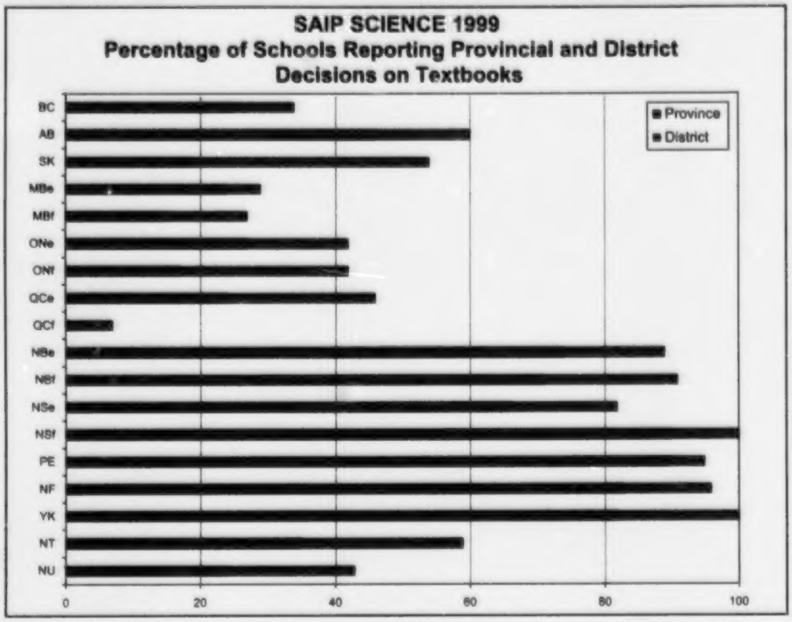


Most influential

	% District	*% Principal*
BC	37	54
AB	25	72
SK	79	14
MBe	36	58
MBf	26	71
ONe	42	58
ONf	57	36
QCe	33	53
QCf	52	39
NBe	85	13
NBf	90	7
NSe	52	48
NSf	83	0
PE	46	43
NF	76	23
YK	0	55
NT	38	31
NU	18	59

Chart 9

In your school, which level has the most influence on decisions regarding textbooks to be used?

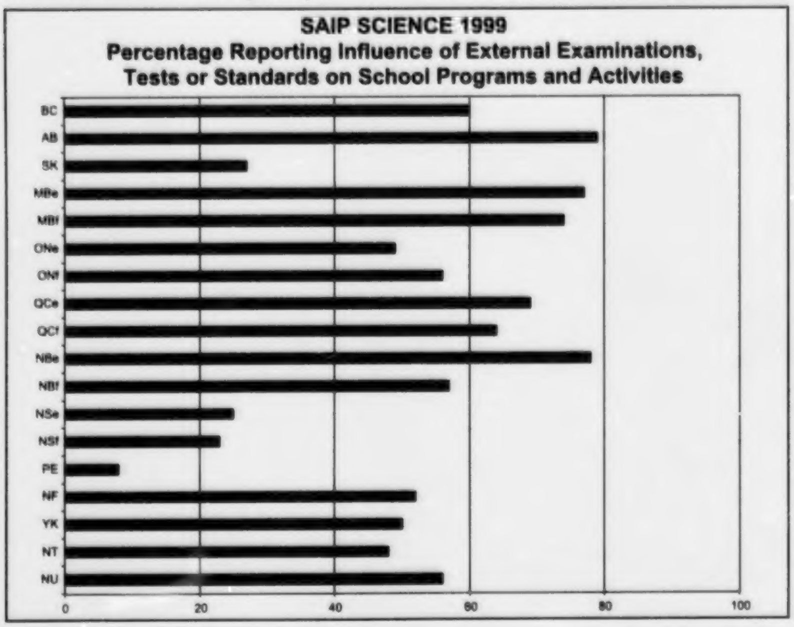


Most influential

	% *Province*	% *District*
BC	25	9
AB	46	14
SK	19	35
MBe	24	5
MBf	15	12
ONe	27	15
ONf	17	25
QCe	24	22
QCf	1	6
NBe	74	15
NBf	71	20
NSe	66	16
NSf	90	10
PE	90	5
NF	83	13
YK	82	18
NT	35	24
NU	24	19

Chart 10

How much influence would you say external examinations, tests, or standards have on your school's overall activities and programs?

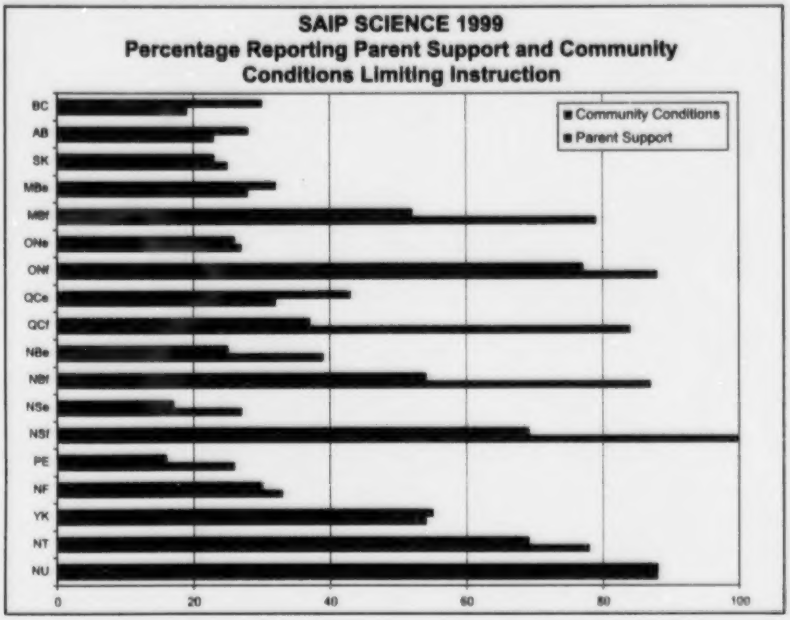


Percentage reporting "some" or "a lot"

	%
BC	60
AB	79
SK	27
MBe	77
MBf	74
ONe	49
ONf	56
QCe	69
QCf	64
NBe	78
NBf	57
NSe	25
NSf	23
PE	8
NF	52
YK	50
NT	48
NU	56

Chart 11

To what degree is your school's capacity to provide instruction limited by the lack of parental support for the school or community conditions (e.g., language, migration)?

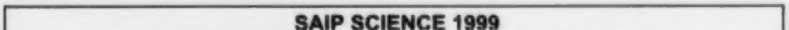


Limiting conditions

	Community Conditions %	*Lack of Parent Support* %
BC	30	19
AB	28	23
SK	23	25
MBe	32	28
MBf	52	79
ONe	26	27
ONf	77	88
QCe	43	32
QCf	37	84
NBe	25	39
NBf	54	87
NSe	17	27
NSf	69	100
PE	16	26
NF	30	33
YK	55	54
NT	69	78
NU	88	88

Chart 12

To what degree is your school's capacity to provide instruction limited by the range of student abilities in the school and students' home backgrounds?

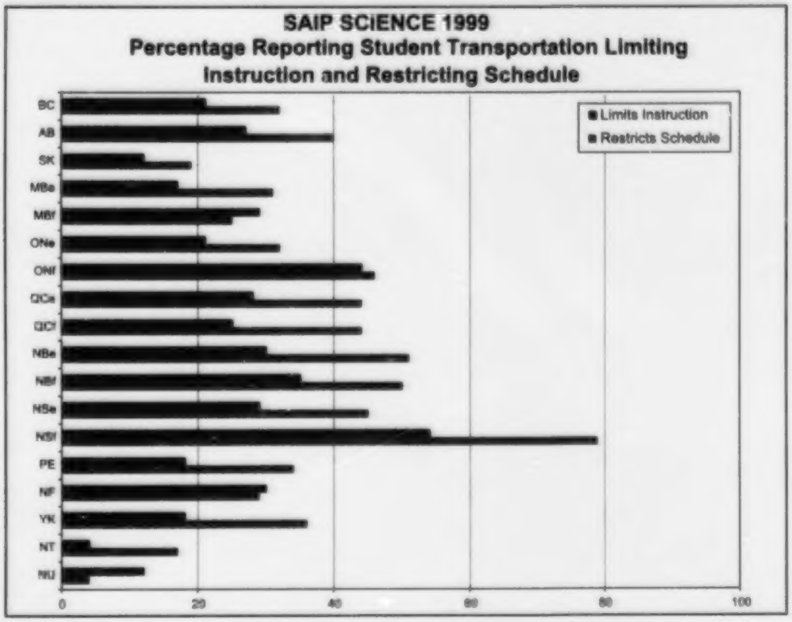


Limiting conditions

	Student Ability %	*Student Home Background* %
BC	45	43
AB	57	52
SK	50	46
MBe	53	51
MBf	70	69
ONe	45	49
ONf	74	79
QCe	55	46
QCf	55	80
NBe	60	63
NBf	76	93
NSe	44	49
NSf	83	62
PE	55	45
NF	60	60
YK	72	91
NT	87	91
NU	100	96

Chart 13

To what degree is your school's capacity to provide instruction limited by the bussing of students?

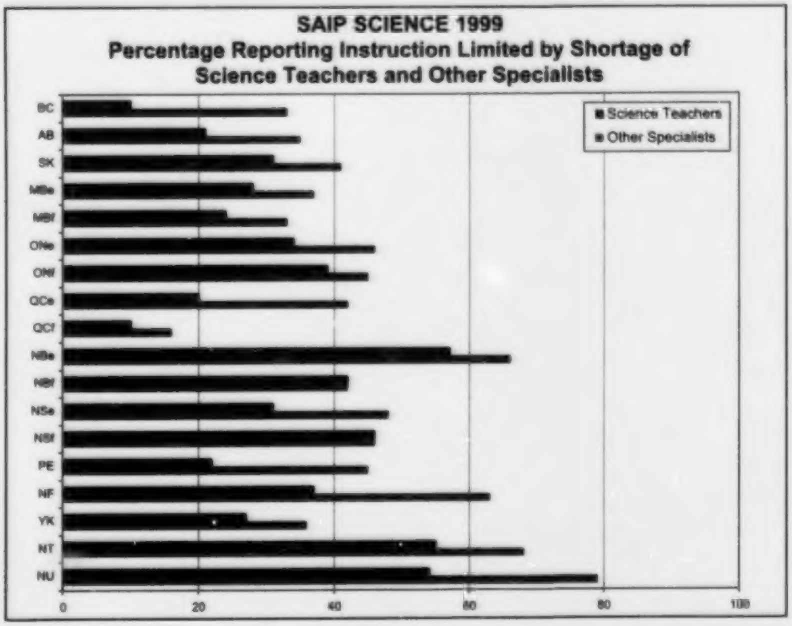


Effects of bussing

	Limits Instruction %	*Restricts Schedule* %
BC	21	32
AB	27	40
SK	12	19
MBe	17	31
MBf	29	25
ONe	21	32
ONf	44	46
QCe	28	44
QCf	25	44
NBe	30	51
NBf	35	50
NSe	29	45
NSf	54	79
PE	18	34
NF	30	29
YK	18	36
NT	4	17
NU	12	4

Chart 14

To what extent is your school's capacity to provide instruction limited by shortage or inadequacy of specialized teaching staff (e.g., guidance) teachers specialized in science?

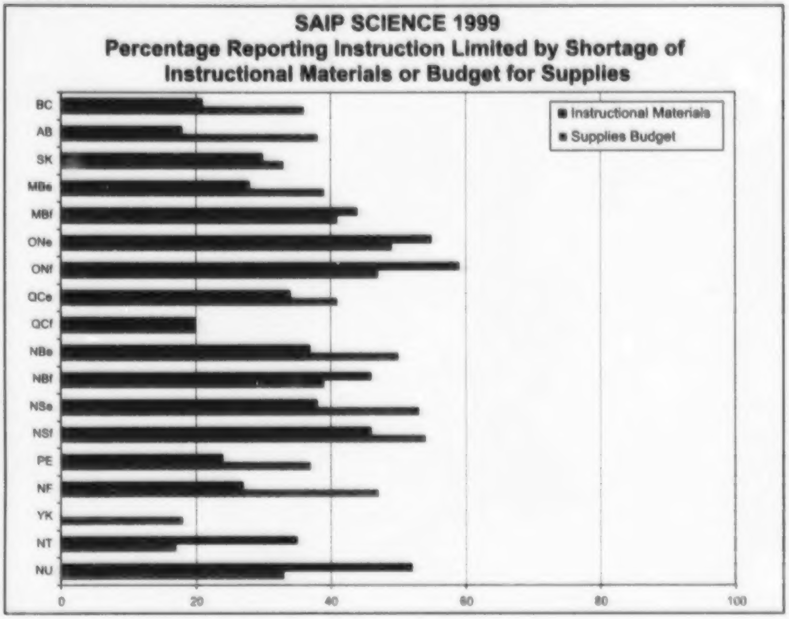


Factors limiting instruction

	Science Teachers %	*Other Specialists* %
BC	10	33
AB	21	35
SK	31	41
MBe	28	37
MBf	24	33
ONe	34	46
ONf	39	45
QCe	20	42
QCf	10	16
NBe	57	66
NBf	42	42
NSe	31	48
NSf	46	46
PE	22	45
NF	37	63
YK	27	36
NT	55	68
NU	54	79

Chart 15

To what extent is your school's capacity to provide instruction limited by shortage or inadequacy of instructional materials (e.g., textbooks) and budget for supplies (e.g., paper, pencils)?

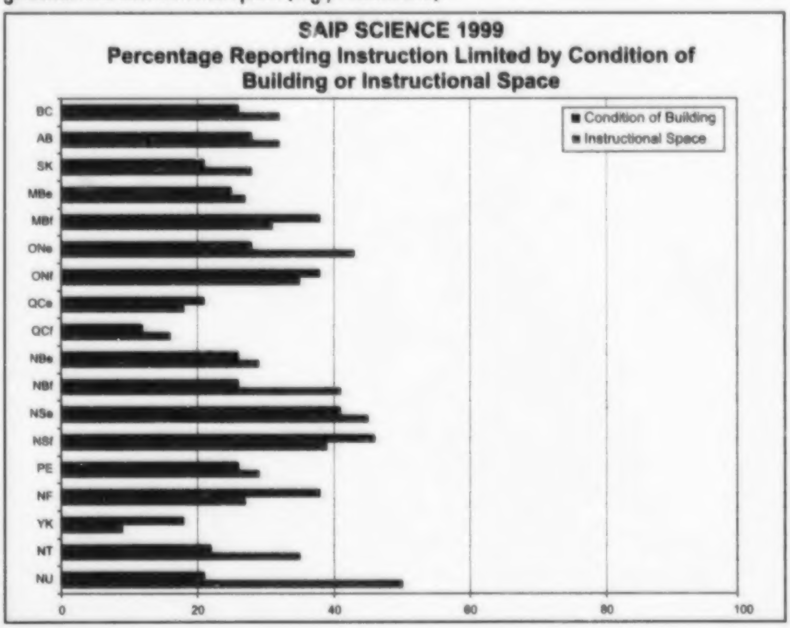


Factors limiting instruction

	Instructional Materials %	*Supplies Budget* %
BC	21	36
AB	18	38
SK	30	33
MBe	28	39
MBf	44	41
ONe	55	49
ONf	59	47
QCe	34	41
QCf	20	20
NBe	37	50
NBf	46	39
NSe	38	53
NSf	46	54
PE	24	37
NF	27	47
YK	0	18
NT	35	17
NU	52	33

Chart 16

To what extent is your school's capacity to provide instruction limited by shortage or inadequacy of condition of school buildings and grounds and instructional space (e.g., classrooms)?

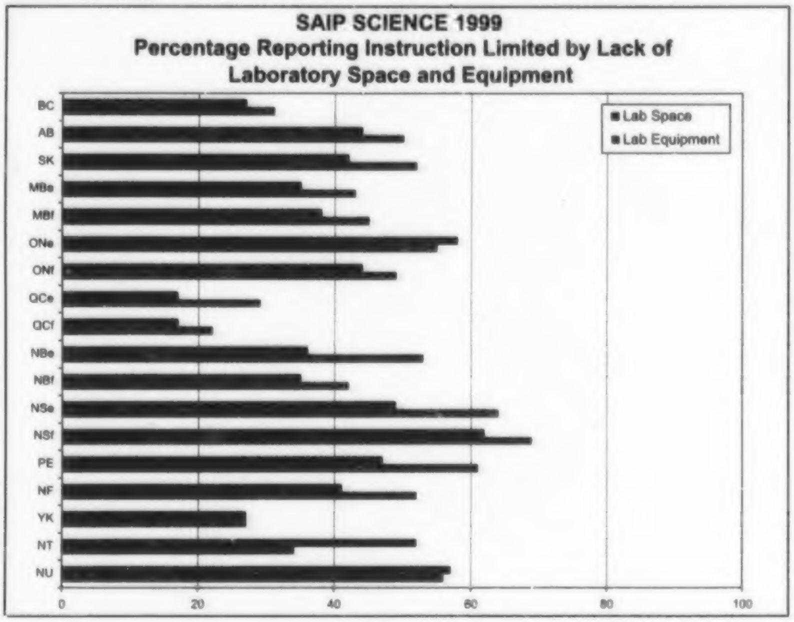


Factors limiting instruction

	Condition of Building %	*Instructional Space* %
BC	26	32
AB	28	32
SK	21	28
MBe	25	27
MBf	38	31
ONe	28	43
ONf	38	35
QCe	21	18
QCf	12	16
NBe	26	29
NBf	26	41
NSe	41	45
NSf	46	39
PE	26	29
NF	38	27
YK	18	9
NT	22	35
NU	21	50

Chart 17

To what extent is your school's capacity to provide instruction limited by shortage or inadequacy of science laboratory space and science laboratory equipment?

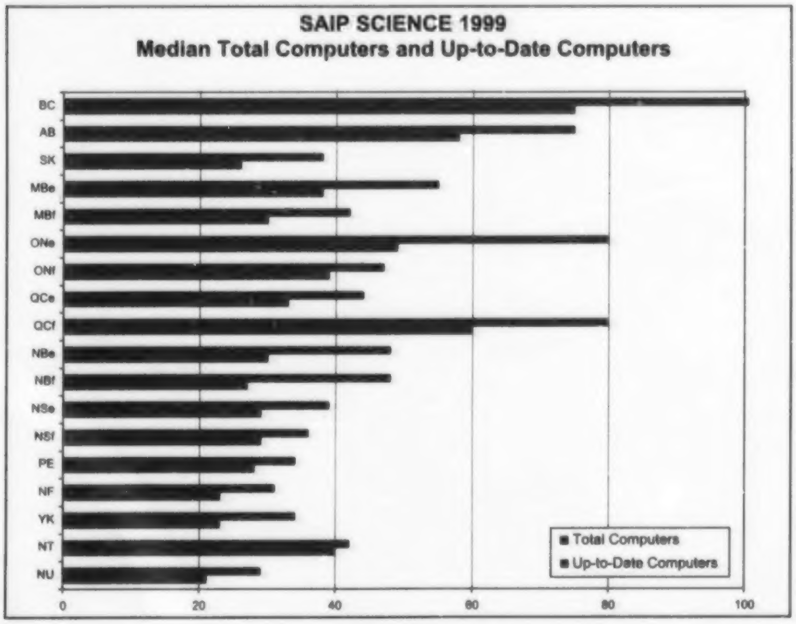


Factors limiting instruction

	Lab Space %	*Lab Equipment* %
BC	27	31
AB	44	50
SK	42	52
MBe	35	43
MBf	38	45
ONe	58	55
ONf	44	49
QCe	17	29
QCf	17	22
NBe	36	53
NBf	35	42
NSe	49	64
NSf	62	69
PE	47	61
NF	41	52
YK	27	27
NT	52	34
NU	57	56

Chart 18

Approximately how many working computers are there in your school and how many of these computers are capable of handling up-to-date software?

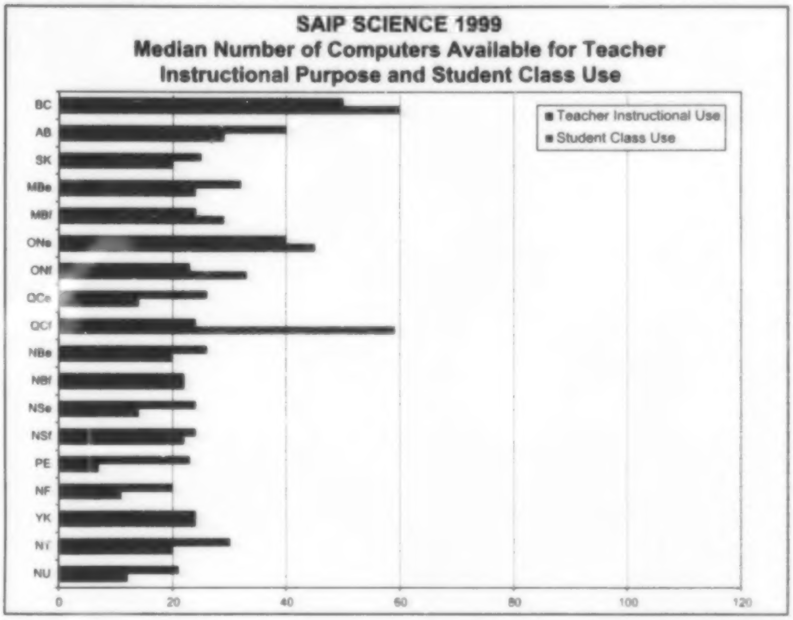


Computers vs. school size (median values)

	Total Computers	*Up-to-Date*	*School Size*
BC	105	75	700
AB	75	58	430
SK	38	26	320
MBe	55	38	350
MBf	42	30	310
ONe	80	49	600
ONf	47	39	270
QCe	44	33	350
QCf	80	60	880
NBe	48	30	425
NBf	48	27	325
NSe	39	29	450
NSf	36	29	325
PE	34	28	340
NF	31	23	235
YK	34	23	115
NT	42	40	245
NU	29	21	165

Chart 19

Approximately how many computers are available to teachers for instructional purposes and to students for use within classes?

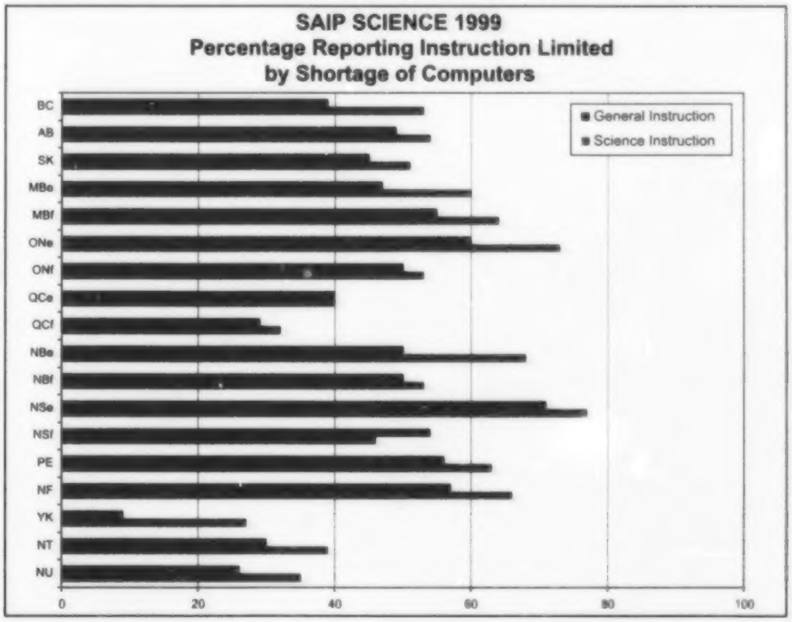


Available computers (median values)

	Teacher Instructional Use	*Student Class Use*
BC	50	60
AB	40	29
SK	25	20
MBe	32	24
MBf	24	29
ONe	40	45
ONf	23	33
QCe	26	14
QCf	24	59
NBe	26	20
NBf	22	22
NSe	24	14
NSf	24	22
PE	23	7
NF	20	11
YK	24	24
NT	30	20
NU	21	12

Chart 20

To what extent is your school's capacity to provide instruction limited by shortage or inadequacy of the number of computers for instructional use and the number of computers for science instruction?

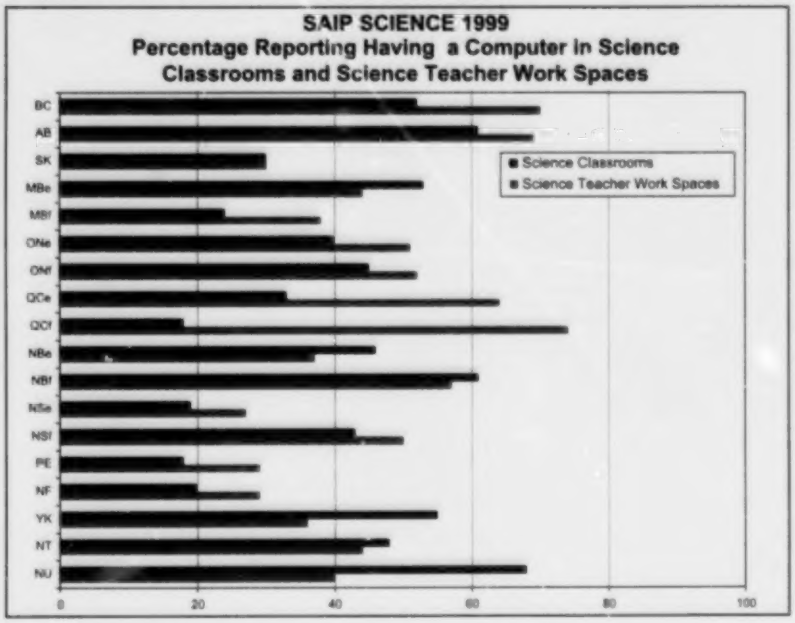


Shortage of computers as limiting factor

	General Instruction %	*Science Instruction* %
BC	39	53
AB	49	54
SK	45	51
MBe	47	60
MBf	55	64
ONe	60	73
ONf	50	53
QCe	40	40
QCf	29	32
NBe	50	68
NBf	50	53
NSe	71	77
NSf	54	46
PE	56	63
NF	57	66
YK	9	27
NT	30	39
NU	26	35

Chart 21

Which of the following can be found for use in science teaching in your school, one computer in all or most science classrooms? Computers for teacher use in science teacher work spaces?

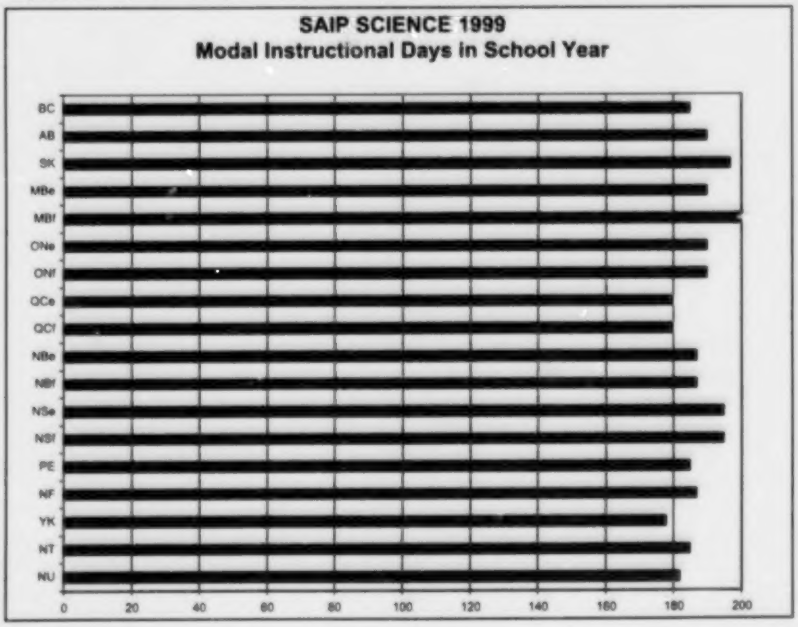


Availability of computers

	Science Classrooms %	*Science Teacher Work Spaces* %
BC	52	70
AB	61	69
SK	30	30
MBe	53	44
MBf	24	38
ONe	40	51
ONf	45	52
QCe	33	64
QCf	18	74
NBe	46	37
NBf	61	57
NSe	19	27
NSf	43	50
PE	18	29
NF	20	29
YK	55	36
NT	48	44
NU	68	40

Chart 22

In your school, how many instructional days are there in the school year?

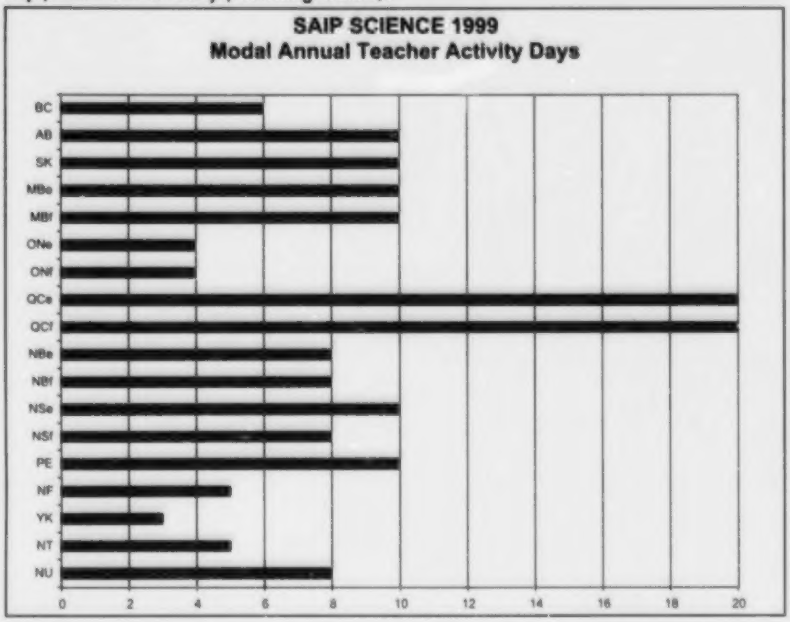


Instructional days

BC	185
AB	190
SK	197
MBe	190
MBf	200
ONe	190
ONf	190
QCe	180
QCf	180
NBe	187
NBf	187
NSe	195
NSf	195
PE	185
NF	187
YK	178
NT	185
NU	182

Chart 23

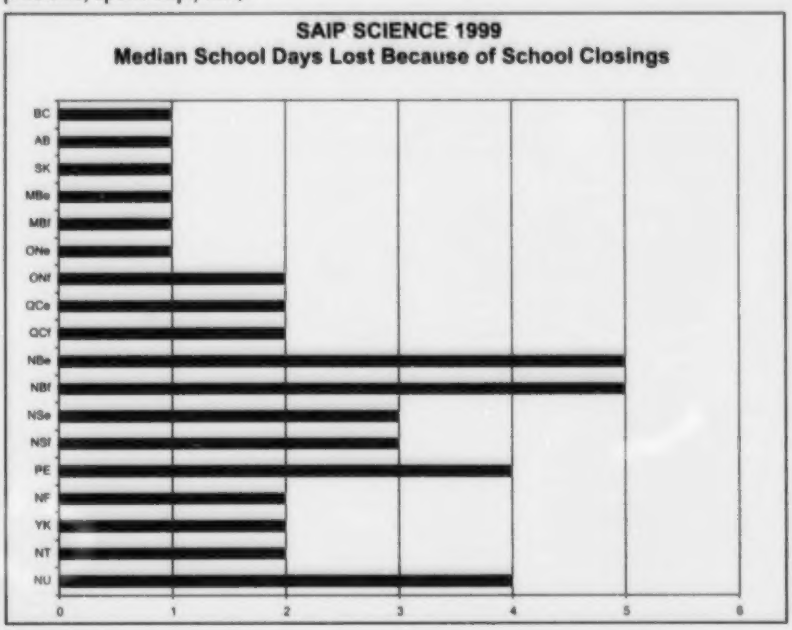
In your school, how many instructional days are provided for teacher activities but not student activities (e.g., professional development days, administrative days, marking exams)?



Teacher activity days	
BC	6
AB	10
SK	10
MBe	10
MBf	10
ONe	4
ONf	4
QCe	20
QCf	20
NBe	8
NBf	8
NSe	10
NSf	8
PE	10
NF	5
YK	3
NT	5
NU	8

Chart 24

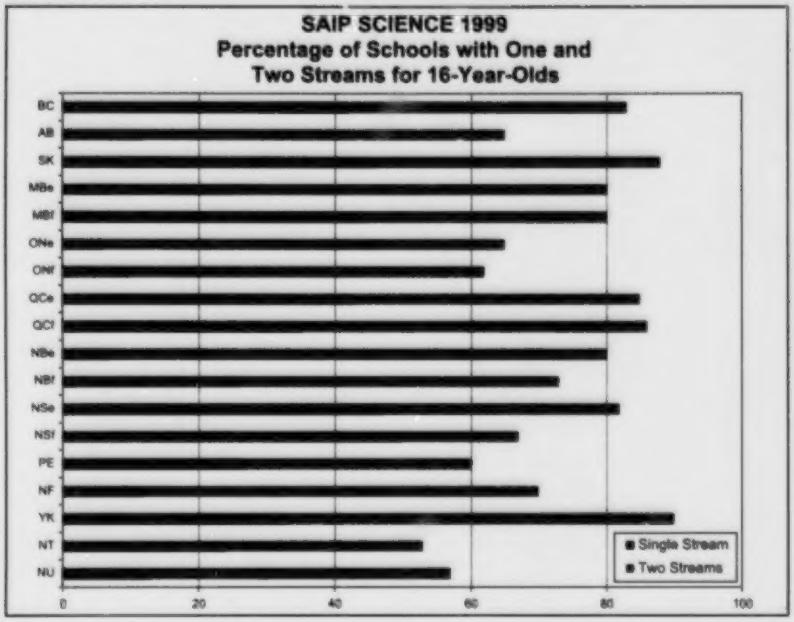
How many instructional days would you estimate are lost in an average year because of school closings (e.g., snowstorms, heating problems, sports days, etc.)?



Lost days (median value)	
BC	1
AB	1
SK	1
MBe	1
MBf	1
ONe	1
ONf	2
QCe	2
QCf	2
NBe	5
NBf	5
NSe	3
NSf	3
PE	4
NF	2
YK	2
NT	2
NU	4

Chart 25

For the same two age (or grade) levels, how many distinct streams or ability groupings exist in your school, single stream or two streams?

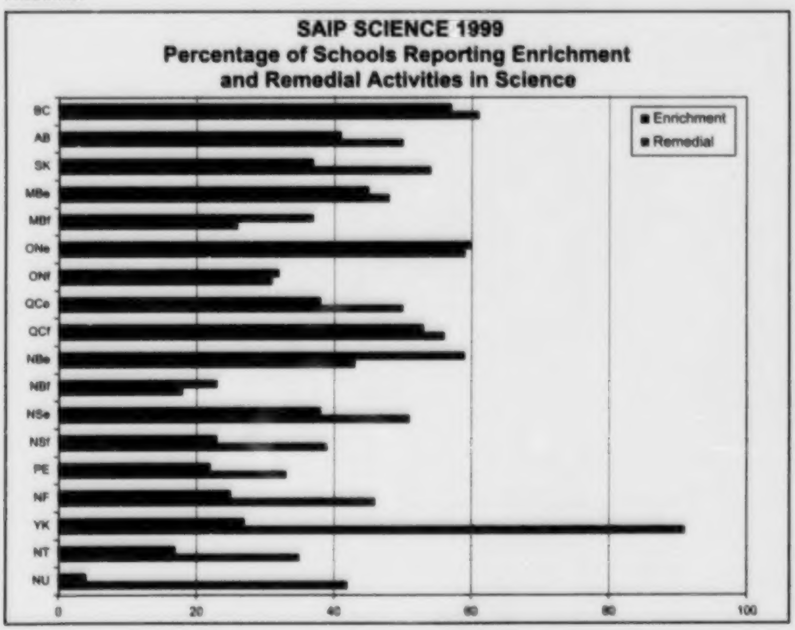


Streaming

	Single Stream %	*Two Streams* %
BC	42	41
AB	12	53
SK	46	42
MBe	25	55
MBf	45	35
ONe	6	59
ONf	10	52
QCe	43	42
QCf	35	51
NBe	7	73
NBf	26	47
NSe	47	35
NSf	50	17
PE	27	33
NF	12	58
YK	33	57
NT	24	29
NU	13	44

Chart 26

Does your school or district provide remedial teaching in science or special enrichment programs/activities in science for gifted students?

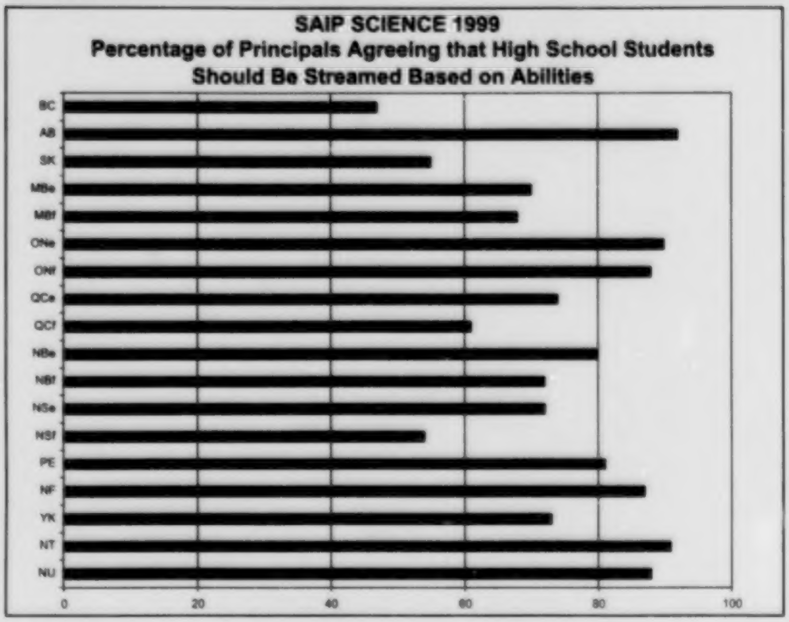


Special-needs provision

	Enrichment %	*Remedial* %
BC	57	61
AB	41	50
SK	37	54
MBe	45	48
MBf	37	26
ONe	60	59
ONf	32	31
QCe	38	50
QCf	53	56
NBe	59	43
NBf	23	18
NSe	38	51
NSf	23	39
PE	22	33
NF	25	46
YK	27	91
NT	17	35
NU	4	42

Chart 27

To what extent does the principal agree that high school students should be streamed into different programs based on their abilities and aptitudes?



Agreement about streaming

	%
BC	47
AB	92
SK	55
MBe	70
MBf	68
ONe	90
ONf	88
QCe	74
QCf	61
NBe	80
NBf	72
NSe	72
NSf	54
PE	81
NF	87
YK	73
NT	91
NU	88

The teacher questionnaire contained 31 items. Questions were asked about teachers' professional background and experience, teaching assignments and duties, class sizes, interaction with parents and other teachers, lesson planning, classroom activities, resource use, constraints on teaching, homework, and student evaluation. Teachers were also asked to indicate their agreement or disagreement with a number of propositions about the nature of science, factors affecting student learning, and streaming for high school students. Finally, an item on "opportunity to learn" was included, in which teachers were asked to indicate whether or not various topics selected from the SAIP Science Framework were being taught or had been taught previously. This item posed some difficulties and is not reported here, pending further analysis of the reliability of responses.

Teacher Background and Experience

Charts 28 to 31 give teacher responses to questions on their background and experience. In general, more than 60% of teachers are female, with the highest percentages of female teachers being in the western provinces, the Yukon, and Newfoundland and Labrador. In general, teachers tend to be in mid-career. However, median years experience varies substantially by province, ranging from a high of 19 years among Quebec anglophones to only three years for Nunavut teachers. More generally, the data show that teachers have tended to spend about half their careers in their current schools, but most of their careers teaching science.

Almost all teachers hold university degrees, the most prevalent degree being the B.Ed. or equivalent, with more than 80% of all teachers holding this degree. One measure of specialization in science is given by the proportion holding B.Sc. degrees, as shown in **Chart 30**. Nationally, this proportion is around 40%, with wide variations being evident across jurisdictions. While large numbers of teachers hold more than one undergraduate degree, the proportion with an advanced degree (master's or equivalent), also shown in **Chart 30**, is quite small and again quite variable across jurisdictions. Among the B.Sc. degrees, biology is the most common area of concentration, accounting for more than half of all science degrees. Chemistry is the next most common concentration, followed by mathematics and physics. Relatively few teachers reported concentrations in earth science or computer science.

As **Chart 31** indicates, almost all teachers hold full-time positions, with only small variations across provinces. **Chart 32** gives an indication of the degree to which teacher assignments are specialized. This shows that teachers are not generally assigned exclusively to science, with total hours on other subjects ranging from about one-fourth in some jurisdictions to up to three-fourths in others.

Class Size

Teachers were asked to give the average size of class they teach, as well as their largest and smallest class sizes. Median average class sizes appear in **Chart 33**. This chart indicates that the overall median class size is around 24, but that there are fairly substantial variations among provinces. The data here are reasonably consistent with those reported by principals, although the wording of the question was slightly different. Data on smallest and largest class sizes show even greater variability, with median smallest classes as low as 10 and as high as 26, and median largest classes ranging from the low 20s to the low 30s.

Time Allocation and Use

Chart 34 shows the modal number of hours per week of scheduled class time. As can be seen, a 25-hour week is the norm in most jurisdictions. Notable exceptions are found for Nunavut and the Northwest Territories, where the modal week was reported as 30 hours. Only small variations were reported by teachers within jurisdictions, presumably because the school week is typically a matter of provincial legislation.

Teachers were asked about the amount of scheduled time lost because of class cancellations, schools closures, and the like, as well as about time lost during class periods through disruptions of various kinds. Modal responses to the first question appear in **Chart 35**. As was the case for principals, a distinct East-West division seems apparent here, with more time being reported lost by teachers in the Eastern provinces and Nunavut. In terms of school days lost, the figures range from two to five across jurisdictions. Time lost during class periods showed a strong bimodal pattern, generally with 30% or more of teachers reporting 5 minutes lost and a further 20% or so reporting 10 minutes lost. This pattern was likely a function of teacher rounding of responses to the nearest five minutes.

Contact with Parents

Chart 36 shows, for each province and territory, the percentage of teachers reporting that they meet with parents once a month or more to discuss individual students. The clearest division here seems to be between the language groups, with teachers in anglophone schools reporting much more

frequent parent contact than their francophone counterparts. Looking at the same issue in a different way, teachers were asked to estimate the proportion of parents with whom they had contact over the school year, both in parent-teacher interviews and on other occasions. The median percentages are reported in **Chart 37**. Again, the variations are quite wide from province to province, but with no obvious pattern. What is clear is that parent-teacher interviews are the main form of contact in all cases, with less than 20% of parents throughout being contacted in other ways.

Lesson Planning

The extent of collaboration among teachers was examined by asking how often respondents meet with other teachers for planning purposes. The percentage reporting meeting once a week or more is shown in **Chart 38**. The figures average about 50% and show fairly substantial variation across jurisdictions.

Teachers were asked how often they used a selection of resources in their lesson planning, including their own previously prepared lessons, materials prepared by other teachers, textbooks, other resource books, curriculum documents, and Internet or other computer-based materials. The results are complex to present in chart form but may be highlighted as follows:

1. There is substantial variability across materials but greater commonality across jurisdictions, suggesting that teachers plan in much the same way wherever they are located.
2. The most commonly used resources are clearly the teacher's own previously prepared lessons and student textbooks.
3. Other text or resource materials are used only relatively rarely.
4. A mixed picture is presented on the use of teacher's guides or teacher editions of textbooks, with about as many teachers reporting infrequent use (a few times a month or less) as frequent use (a few times a week or more).
5. Provincial curriculum guides are used regularly by less than half the teachers generally. Quebec teachers, both anglophone and francophone, exhibit this tendency more than others, with very few teachers reporting frequent use. Teachers in Newfoundland and Labrador are at the opposite end of the spectrum, with more than 60% reporting frequent use.
6. Internet or other computer-based materials are not in common use, with about 15% of teachers, and a range across provinces of 11% to 20%, reporting frequent use. Media-generated materials were reported as used even less often, with an average of about 10% of teachers reporting frequent use.

Classroom Activities

Teachers were given a fairly lengthy list of activities and resources that might be used in their classrooms and asked to report the frequency of use. Again, for brevity, only the highlights will be presented.

1. Note giving was a strongly prevalent activity, with more than 70% of teachers in almost all jurisdictions reporting frequent use. A similar pattern was apparent for showing students how to do problems, attempting to diagnose individual student problems or weaknesses, students working alone on assigned work, and the teacher working with individual students.
2. Less common were activities such as working on long-term science projects, giving feedback on assignments or other evaluations, and discussing upcoming quizzes or tests. Going outdoors on field trips was quite rare, with no more than 3% of teachers reporting frequent use.
3. The prevalence of students studying the textbook, teacher reading from the textbook, and teacher helping students develop general learning strategies was variable across jurisdictions.

Because of a general belief that it is important to have students do laboratory experiments in science, the results for this item are presented in **Chart 39**. Clearly, the use of laboratory experiments is more prevalent in Ontario and Quebec and, to a slightly lesser degree, in the three Western provinces than elsewhere.

Resource Use

Charts 40, 41, and 42 show the percentages of teachers reporting use of various resources in their science classes. The item on science books and magazines shows a strong language division, with francophone teachers using such resources substantially less often than anglophone teachers. As for common audiovisual equipment, **Chart 41** indicates substantial, though variable, use of overhead projectors but substantially less frequent use of other such resources. Use of computers and the Internet or World Wide Web is even lower and much less variable than other resources.

Questioning

Questioning is generally regarded as one of the most common of teaching activities. This is clear from the data in **Chart 43**, where generally around 80% of teachers reported questioning individual students or the whole class several times or more during a class. Questioning was explored further by asking whether the teacher targets questions to specific kinds of students. **Chart 44** shows responses for questioning reticent students and students the teacher feels are not paying attention, to improve their participation. In general, students not paying attention are the targets of teacher questioning more often than reticent students. A similar question on targeting the best students to make it more likely to get a good answer yielded relatively low percentage responses throughout. Finally, teachers were asked about expected responses to questions. **Charts 45 and 46** show the results for student and teacher questions requiring brief responses and elaborated responses, respectively. Clearly, both types of response are reported as occurring relatively often, with brief responses showing higher and slightly more variable use than elaborated responses.

Factors Limiting Science Teaching

The questions asked of teachers in this area were more specific to science teaching than those described earlier for principals. Responses to two questions on student characteristics are given in **Chart 47**, with the bars representing the combined response for the categories "quite a lot" and "a great deal." It is clear that range of student ability is seen as a more restricting factor than variation in student backgrounds. This factor also shows greater variation across jurisdictions. Generally, teachers in the territories show greater concern with both these factors than teachers elsewhere in Canada.

Percentages of teachers indicating lack of computers and laboratory equipment as restricting factors are given in **Chart 48**. Although most of these percentages are relatively small, substantial variation is evident across jurisdictions. Similar comments apply to the data on physical facilities and class size, as indicated in **Chart 49**, although there is no obvious connection between the patterns in the two cases.

Homework

Chart 50 gives the percentages of teachers giving assignments more than three times per week, with students being expected to spend more than 30 minutes doing this homework. It is clear that homework on this scale is not expected by large numbers of teachers. Also, the actual frequency and amount is fairly variable across jurisdictions. In addition, there is no correlation between frequency and amount, suggesting that teachers do not generally compensate for more frequent homework by expecting less time per homework assignment. The most common type of homework activity is working on problems or questions from the textbook. Using worksheets or workbooks and reading the text or supplementary materials are also common. Students are rarely asked to work on long-term projects, to prepare oral reports, or to keep a journal. Although there were variations in each of these activities by province, the general pattern of homework types was quite consistent.

On average, about 60% of teachers reported that they frequently (a few times a week or more) record whether or not students have completed their homework. A similar percentage frequently give feedback on homework to the whole class. About half of all teachers frequently collect, correct, and return homework assignments, while many fewer (about 30%) actually keep the homework assignments after correcting. The proportion of teachers using homework to contribute toward final grades is highly variable, averaging around 50%, but varying from a high of 78% in the Yukon to 17% among Quebec francophone teachers.

Student Assessment

Teachers use a wide variety of different forms of work in assessing students. The greatest weight is usually placed on teacher-made tests, of either the short-answer or essay type or the selected-response type. Substantial weight is also generally placed on homework assignments and projects or laboratory work. Effort and improvement tend to be given moderate weights, with distinct variations among provinces in the use of these indicators. Low weight is given to standardized tests, attendance, interviews and observations, class participation, and student self- or peer assessment. Almost all teachers use 10 or more separate scores in compiling their grades. A 1notable exception to this pattern is found for Quebec francophone teachers, who tend to use many fewer indicators.

Views on Science and Student Learning

A four-point scale (strongly disagree, disagree, agree, strongly agree) was used to examine teacher opinions on a number of propositions about the nature of science, and the role of home background, talent, ability, and work in student learn-

ing. Responses to a selection of these items are given in Charts 51 to 53, using the combined "agree" and "strongly agree" categories as the basis for the plots.

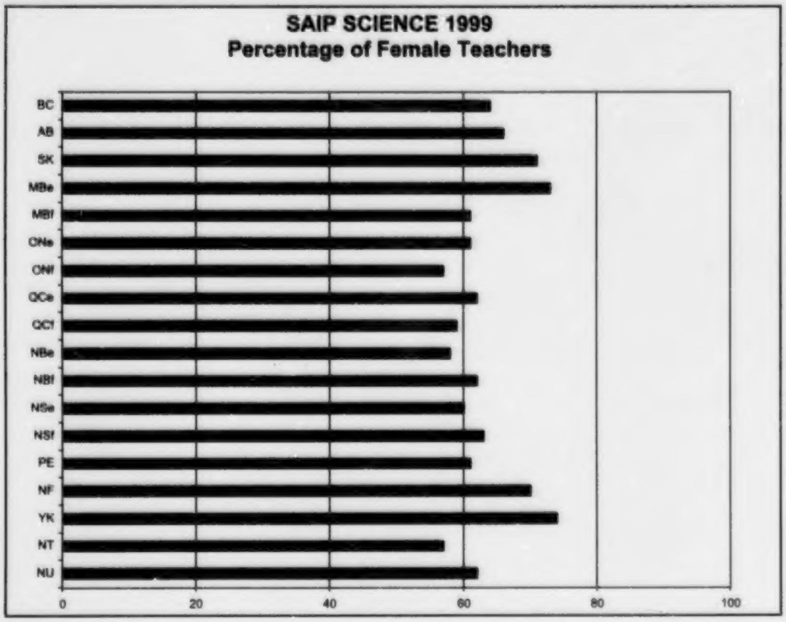
On the nature of science, as shown in **Chart 51**, it is clear that teachers almost universally agree that science is better thought of as a process than as a body of knowledge and concepts. Responses were more moderate and variable to the proposition that science is primarily a body of knowledge and concepts — and Quebec francophone teachers were distinctly less likely than anyone else to support the latter statement.

As **Chart 52** indicates, only small proportions of teachers agree with the proposition that students need natural talent to do well in science courses. In contrast, there is strong agreement that hard work is needed to do well. Related to this, there was also strong agreement (80%–90% agree and strongly agree) on two further propositions, the first on the influence of ability, and the second on the influence of the home environment on achievement.

Streaming is an important policy issue in secondary education throughout the country. **Chart 53** gives percentages of agreement with the statement that high school students should be streamed into different programs based on their abilities. A strong majority of teachers clearly support this proposition, although there are notable variations across provinces, from a low of less than 60% in British Columbia and Saskatchewan to a high of more than 90% in both Ontario French and Ontario English populations. The response pattern here is similar to that found for principals, suggesting that attitudes toward streaming are more closely associated with jurisdiction than with position.

Chart 28

Are you female or male?

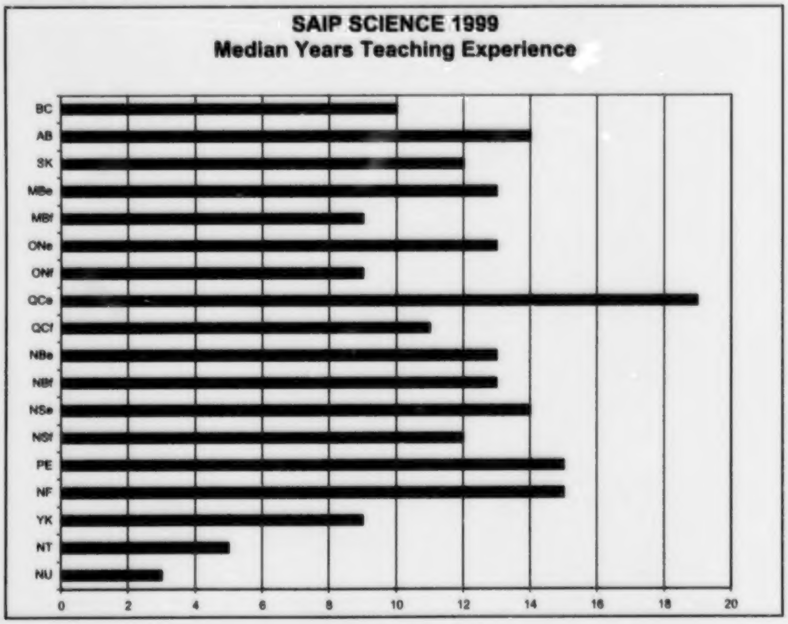


Female teachers

	Female %
BC	64
AB	66
SK	71
MBe	73
MBf	61
ONe	61
ONf	57
QCe	62
QCf	59
NBe	58
NBf	62
NSe	60
NSf	63
PE	61
NF	70
YK	74
NT	57
NU	62

Chart 29

Counting this year, how many years' teaching experience do you have in total?

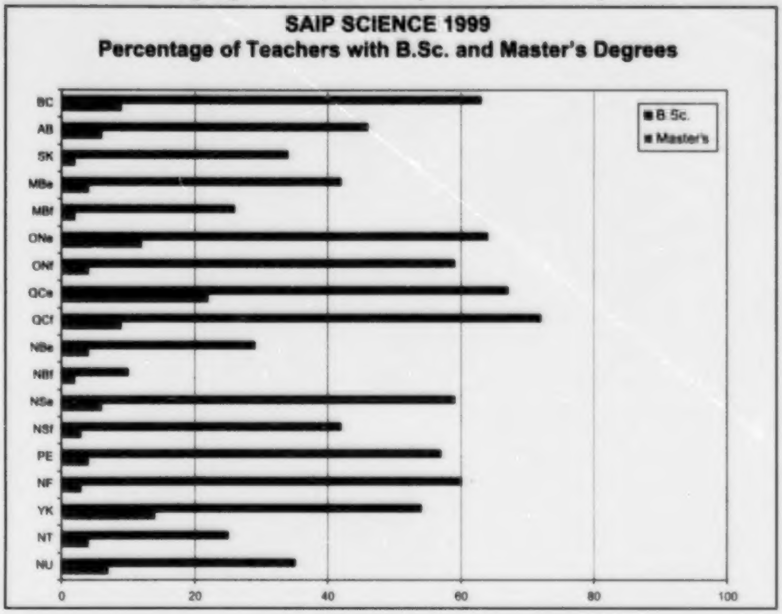


Teaching experience

	Median Total Experience	*Median Experience—Current School*
BC	10	5
AB	14	6
SK	12	5
MBe	13	7
MBf	9	5
ONe	13	6
ONf	9	5
QCe	19	7
QCf	11	7
NBe	13	7
NBf	13	6
NSe	14	6
NSf	12	7
PE	15	8
NF	15	6
YK	9	2
NT	5	1
NU	3	1

Chart 30

Which of the following degrees or diplomas do you hold? B.Sc. or equivalent? Master's degree?

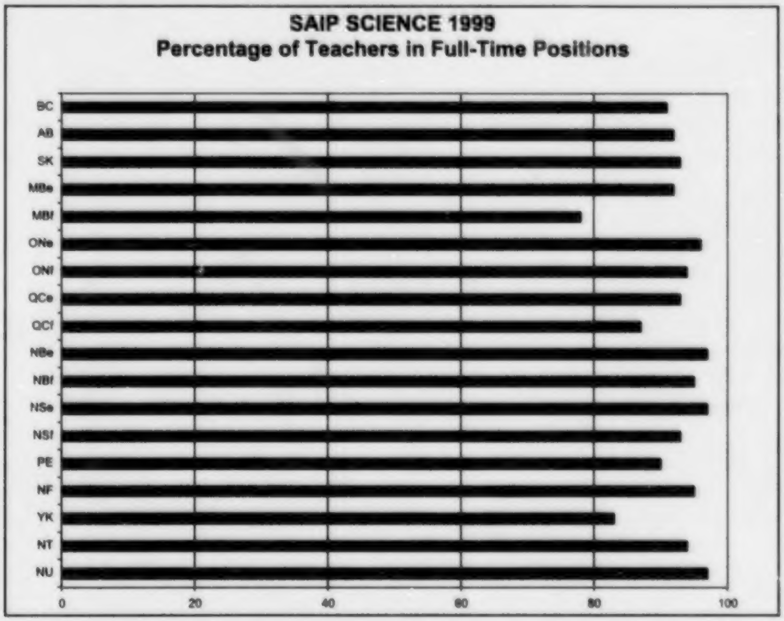


Degrees

	B.Sc.	*Master's*
BC	63	9
AB	46	6
SK	34	2
MBe	42	4
MBf	26	2
ONe	64	12
ONf	59	4
QCe	67	22
QCf	72	9
NBe	29	4
NBf	10	2
NSe	59	6
NSf	42	3
PE	57	4
NF	60	3
YK	54	14
NT	25	4
NU	35	7

Chart 31

Is your position full-time or part-time?

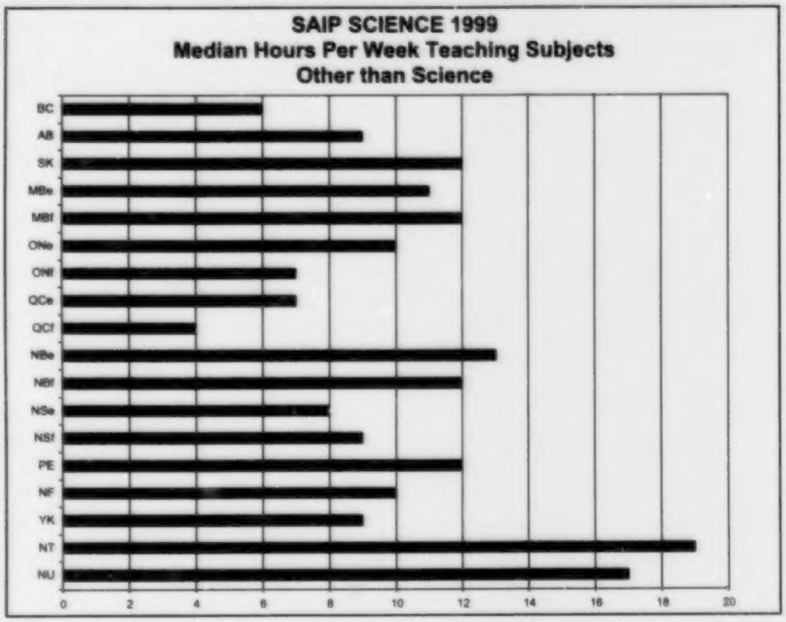


Percentage in full-time positions

	%
BC	91
AB	92
SK	93
MBe	92
MBf	78
ONe	96
ONf	94
QCe	93
QCf	87
NBe	97
NBf	95
NSe	97
NSf	93
PE	90
NF	95
YK	83
NT	94
NU	97

Chart 32

How many hours per week are you scheduled to teach other subjects (non-science)?

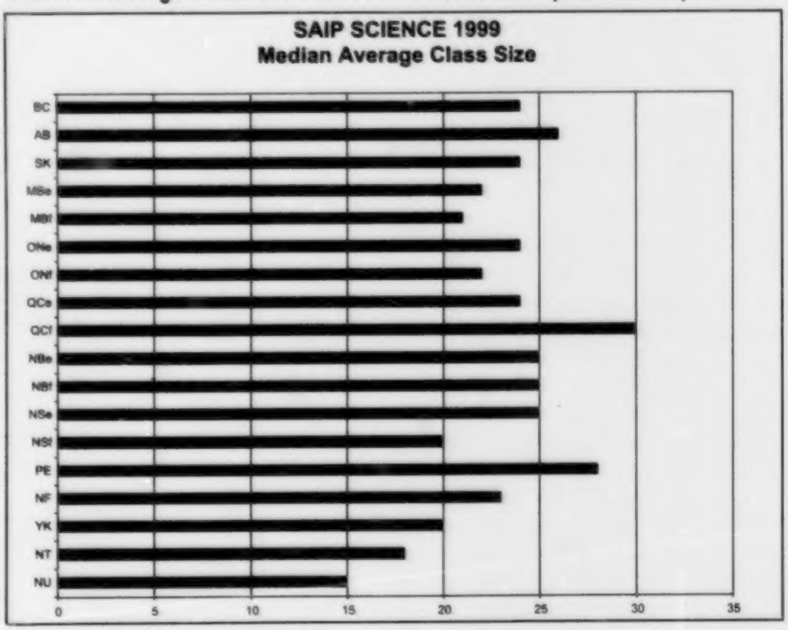


Hours teaching other subjects

	Median
BC	6
AB	9
SK	12
MBe	11
MBf	12
ONe	10
ONf	7
QCe	7
QCf	4
NBe	13
NBf	12
NSe	8
NSf	9
PE	12
NF	10
YK	9
NT	19
NU	17

Chart 33

What is the average number of students in the science classes you teach this year?

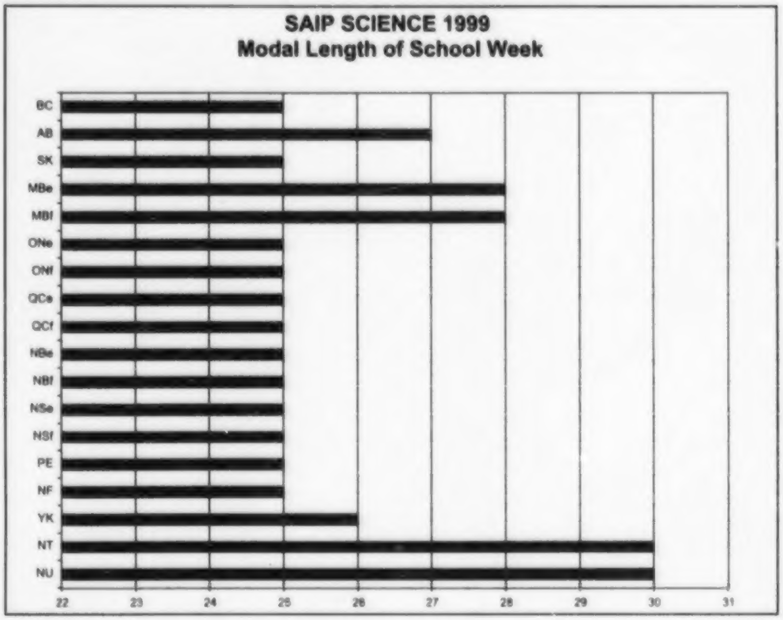


Average science class size

	Provincial/Territorial Median
BC	24
AB	26
SK	24
MBe	22
MBf	21
ONe	24
ONf	22
QCe	24
QCf	30
NBe	25
NBf	25
NSe	25
NSf	20
PE	28
NF	23
YK	20
NT	18
NU	15

Chart 34

How many hours of scheduled class time does your school have per week?

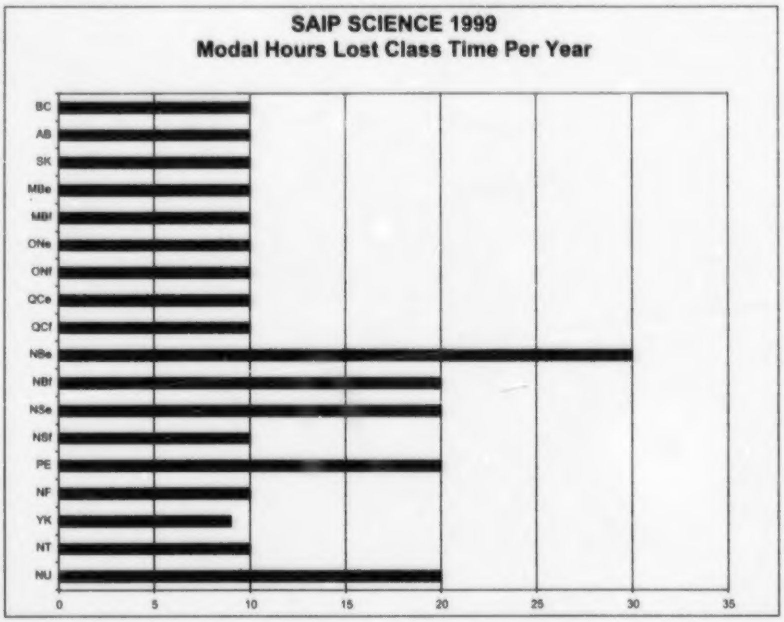


Scheduled class time

	Median Hours
BC	25
AB	27
SK	25
MBe	28
MBf	28
ONe	25
ONf	25
QCe	25
QCf	25
NBe	25
NBf	25
NSe	25
NSf	25
PE	25
NF	25
YK	26
NT	30
NU	30

Chart 35

On average, over a full school year, how many hours of your scheduled teaching time would you estimate is lost because of class cancellations, school closures, or other losses of whole class periods or school days?

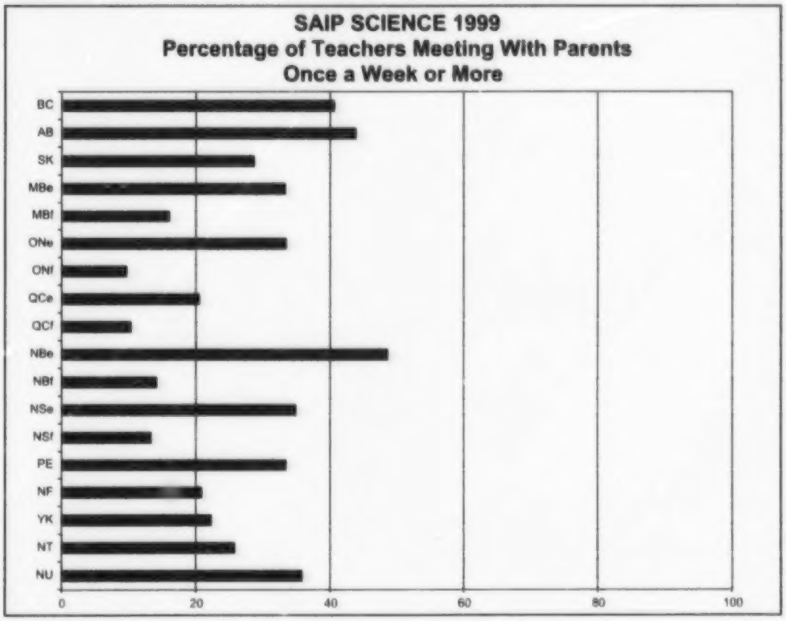


Lost teaching time

	Median Hours
BC	10
AB	10
SK	10
MBe	10
MBf	10
ONe	10
ONf	10
QCe	10
QCf	10
NBe	30
NBf	20
NSe	20
NSf	10
PE	20
NF	10
YK	9
NT	10
NU	20

Chart 36

Altogether, about how often do you meet with or speak by telephone to parents to discuss individual students?

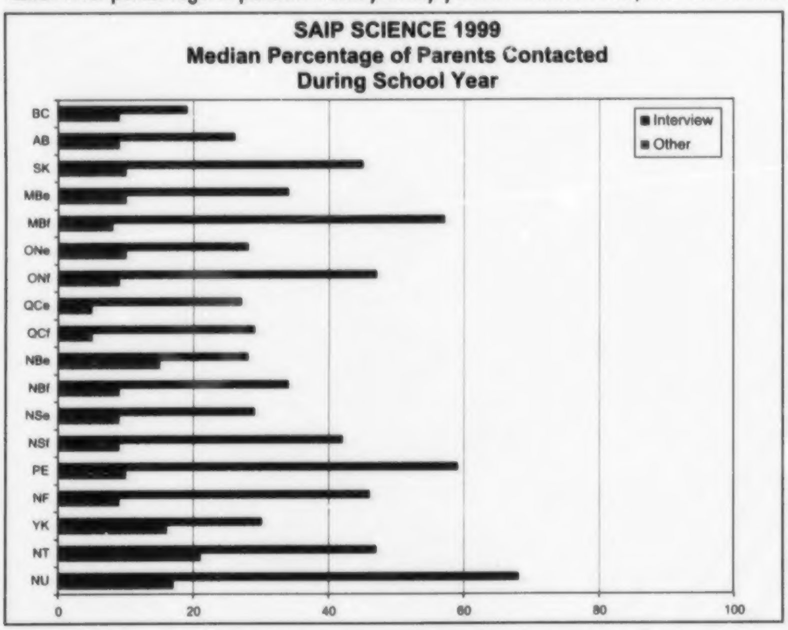


Parent/teacher communications once a week or more

	%
BC	40.6
AB	43.8
SK	28.6
MBe	33.3
MBf	16
ONe	33.4
ONf	9.6
QCe	20.5
QCf	10.2
NBe	48.6
NBf	14.1
NSe	34.8
NSf	13.3
PE	33.4
NF	20.8
YK	22.3
NT	25.8
NU	35.8

Chart 37

About what percentage of parents would you say you have contact with, over a full school year?

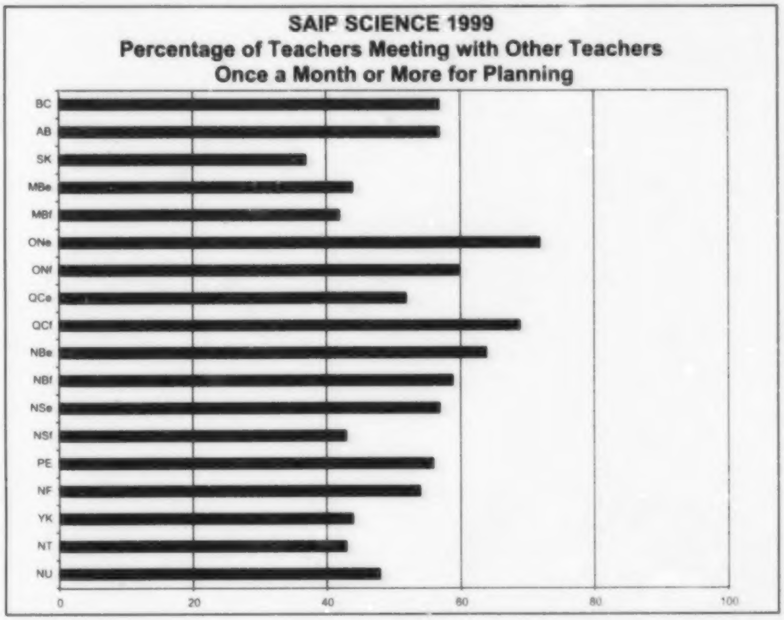


Contact with parents

	Interview—Median %	*Other—Median* %
BC	19	9
AB	26	9
SK	45	10
MBe	34	10
MBf	57	8
ONe	28	10
ONf	47	9
QCe	27	5
QCf	29	5
NBe	28	15
NBf	34	9
NSe	29	9
NSf	42	9
PE	59	10
NF	46	9
YK	30	16
NT	47	21
NU	68	17

Chart 38

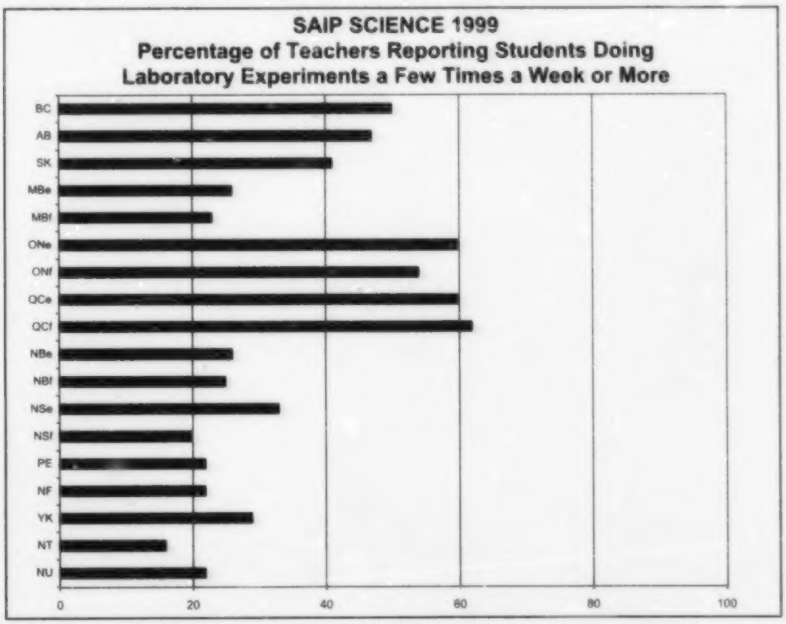
About how often do you meet with other teachers to plan lessons, units, tests, or other program matters?



Frequency of planning meetings with other teachers	%
BC	57
AB	57
SK	37
MBe	44
MBf	42
ONe	72
ONf	60
QCe	52
QCf	69
NBe	64
NBf	59
NSe	57
NSf	43
PE	56
NF	54
YK	44
NT	43
NU	48

Chart 39

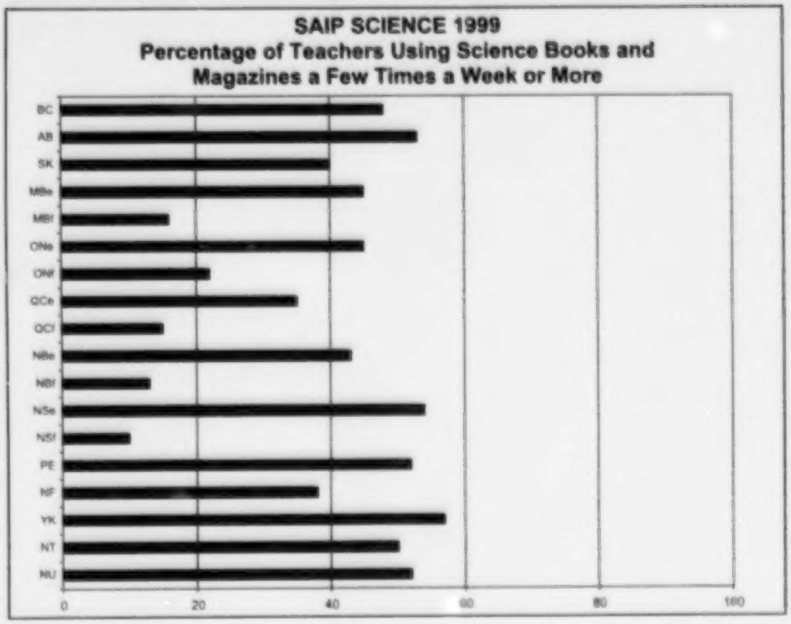
How often do the following things happen in your science classes? Students do laboratory experiments



Lab experiments a few times/week or more	%
BC	50
AB	47
SK	41
MBe	26
MBf	23
ONe	60
ONf	54
QCe	60
QCf	62
NBe	26
NBf	25
NSe	33
NSf	20
PE	22
NF	22
YK	29
NT	16
NU	22

Chart 40

How often are science books and magazines used in your science classes?

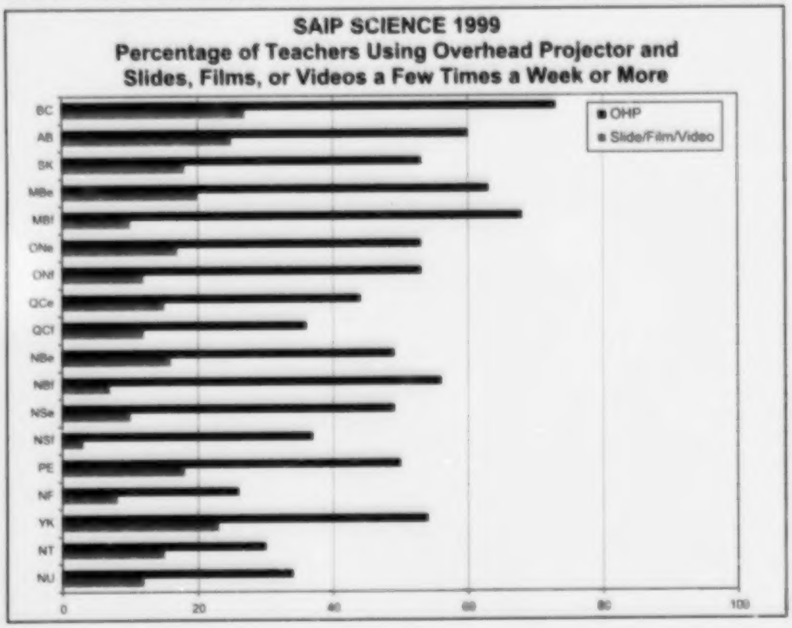


Use of science books and magazines

	%
BC	48
AB	53
SK	40
MBe	45
MBf	16
ONe	45
ONf	22
QCe	35
QCf	15
NBe	43
NBf	13
NSe	54
NSf	10
PE	52
NF	38
YK	57
NT	50
NU	52

Chart 41

How often are overhead projector, slides, films, or videos used in your science classes?

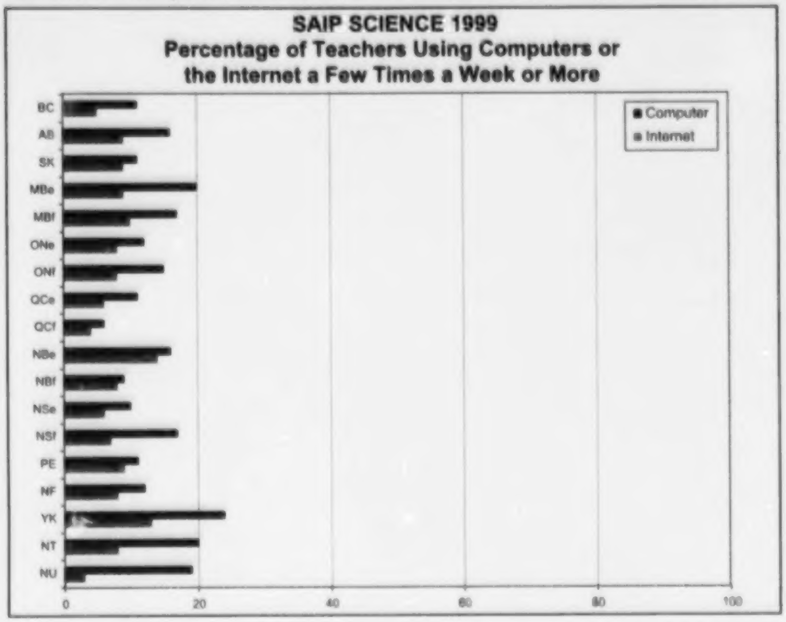


Use of projectors, slides, etc.

	OHP %	*Slide/Film/Video* %
BC	73	27
AB	60	25
SK	53	18
MBe	63	20
MBf	68	10
ONe	53	17
ONf	53	12
QCe	44	15
QCf	36	12
NBe	49	16
NBf	56	7
NSe	49	10
NSf	37	3
PE	50	18
NF	26	8
YK	54	23
NT	30	15
NU	34	12

Chart 42

How often are computers, the Internet, or World Wide Web used in your science classes?



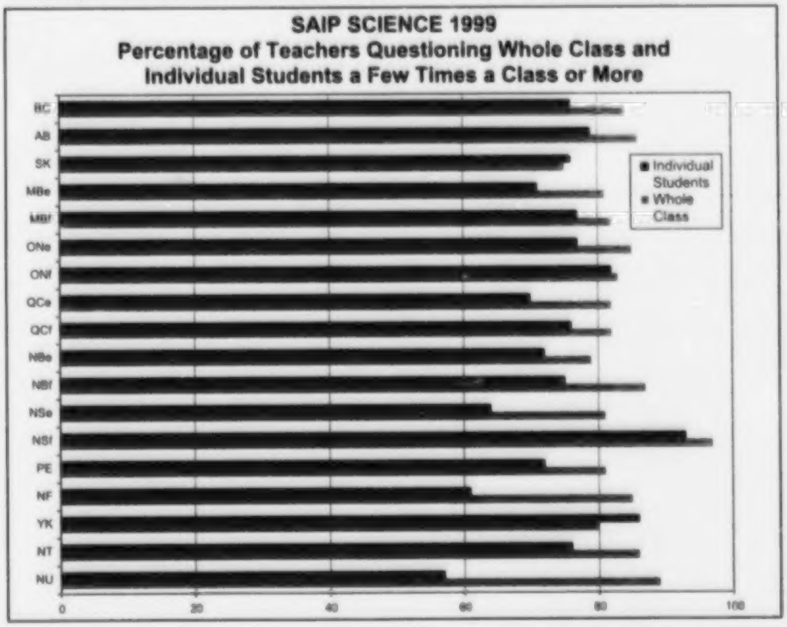
Use of computers and Internet

	Computer %	*Internet* %
BC	11	5
AB	16	9
SK	11	9
MBe	20	9
MBf	17	10
ONe	12	8
ONf	15	8
QCe	11	6
QCf	6	4
NBe	16	14
NBf	9	8
NSe	10	6
NSf	17	7
PE	11	9
NF	12	8
YK	24	13
NT	20	8
NU	19	3

Chart 43

How often are the following questioning techniques used in your science classes?

I ask questions of individual students by name or to the class as a whole.



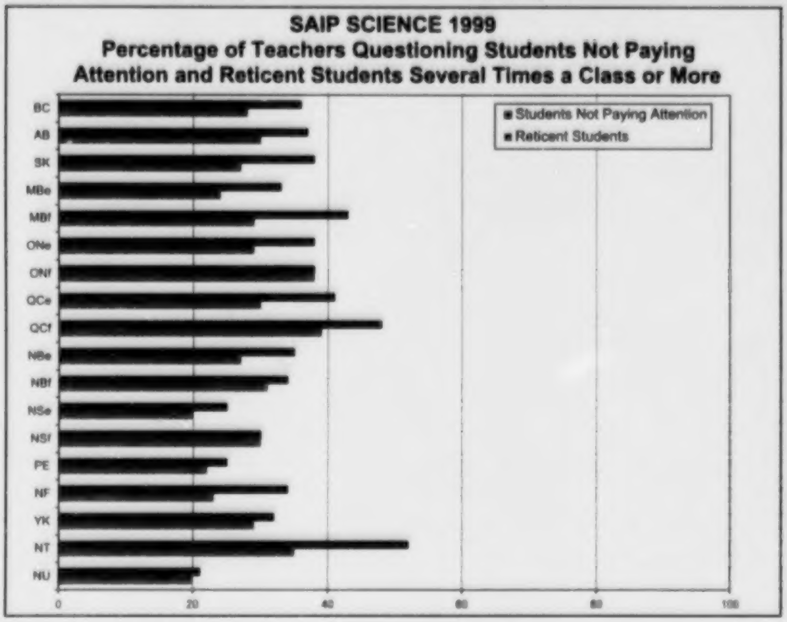
Questioning techniques

	Individual Students %	*Whole Class* %
BC	76	84
AB	79	86
SK	76	75
MBe	71	81
MBf	77	82
ONe	77	85
ONf	82	83
QCe	70	82
QCf	76	82
NBe	72	79
NBf	75	87
NSe	64	81
NSf	93	97
PE	72	81
NF	61	85
YK	86	80
NT	76	86
NU	57	89

Chart 44

How often are the following questioning techniques used in your science classes?

I ask questions specifically to students I feel are not paying attention or of reticent students to help improve their participation.



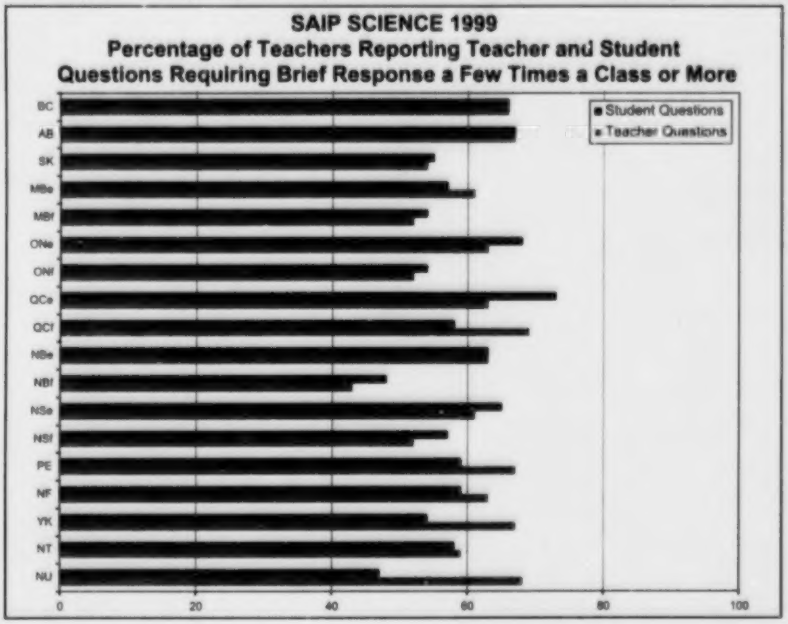
Questioning techniques

	To Students Not Paying Attention %	*To Reticent Students* %
BC	36	28
AB	37	30
SK	38	27
MBe	33	24
MBf	43	29
ONe	38	29
ONf	38	38
QCe	41	30
QCf	48	39
NBe	35	27
NBf	34	31
NSe	25	20
NSf	30	30
PE	25	22
NF	34	23
YK	32	29
NT	52	35
NU	21	20

Chart 45

How often are the following questioning techniques used in your science classes?

I ask questions requiring brief responses. Students ask questions requiring a brief response by the teacher.



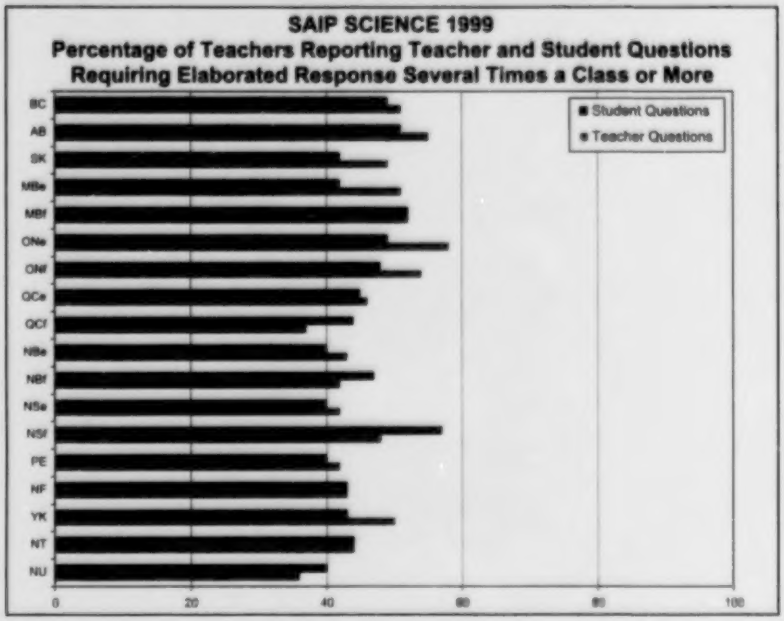
Questioning techniques

	Student Question %	*Teacher Question* %
BC	66	66
AB	67	67
SK	55	54
MBe	57	61
MBf	54	52
ONe	68	63
ONf	54	52
QCe	73	63
QCf	58	69
NBe	63	63
NBf	48	43
NSe	65	61
NSf	57	52
PE	59	67
NF	59	63
YK	54	67
NT	58	59
NU	47	68

Chart 46

How often are the following questioning techniques used in your science classes?

I ask questions requiring more elaborated responses (e.g., a few sentences). Students ask questions requiring an elaborated response by the teacher.

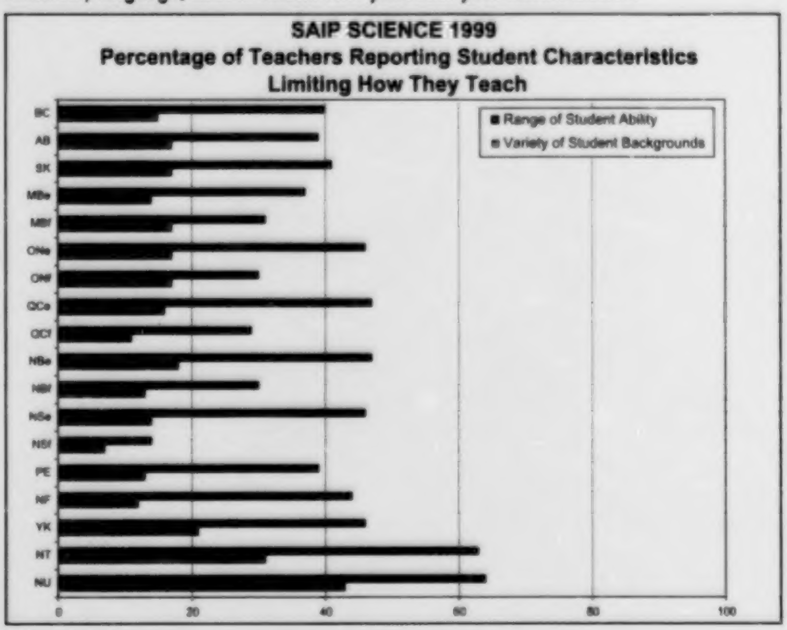


Questioning techniques

	Student Questions %	*Teacher Questions* %
BC	49	51
AB	51	55
SK	42	49
MBe	42	51
MBf	52	52
ONe	49	58
ONf	48	54
QCe	45	46
QCf	44	37
NBe	40	43
NBf	47	42
NSe	40	42
NSf	57	48
PE	40	42
NF	43	43
YK	43	50
NT	44	44
NU	40	36

Chart 47

To what extent does the the range of student abilities in the class or students who come from a wide variety of backgrounds (e.g., economic, language) limit or restrict how you teach your science classes?

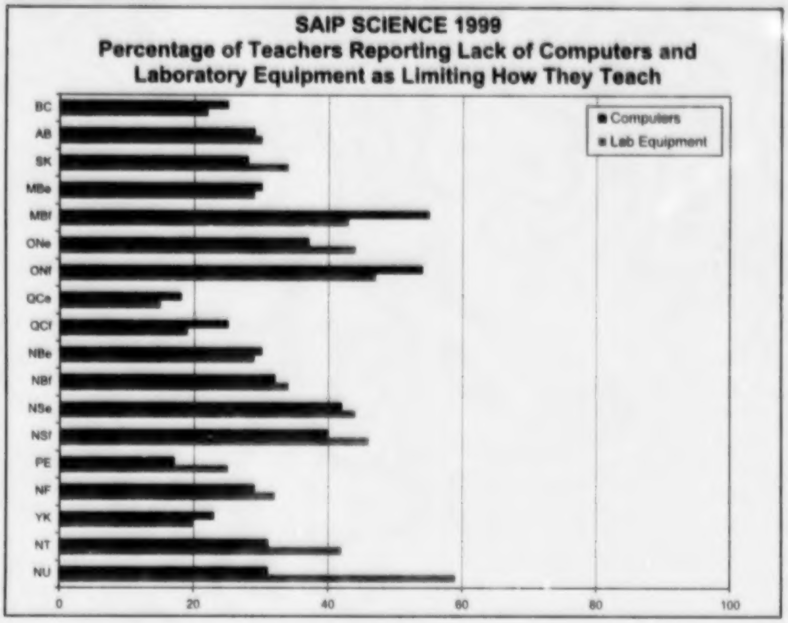


Student characteristics

	Ability %	*Background* %
BC	40	15
AB	39	17
SK	41	17
MBe	37	14
MBf	31	17
ONe	46	17
ONf	30	17
QCe	47	16
QCf	29	11
NBe	47	18
NBf	30	13
NSe	46	14
NSf	14	7
PE	39	13
NF	44	12
YK	46	21
NT	63	31
NU	64	43

Chart 48

To what extent do the following limit or restrict how you teach your science classes — shortage of computer hardware or software, shortage of equipment for laboratories or demonstrations?

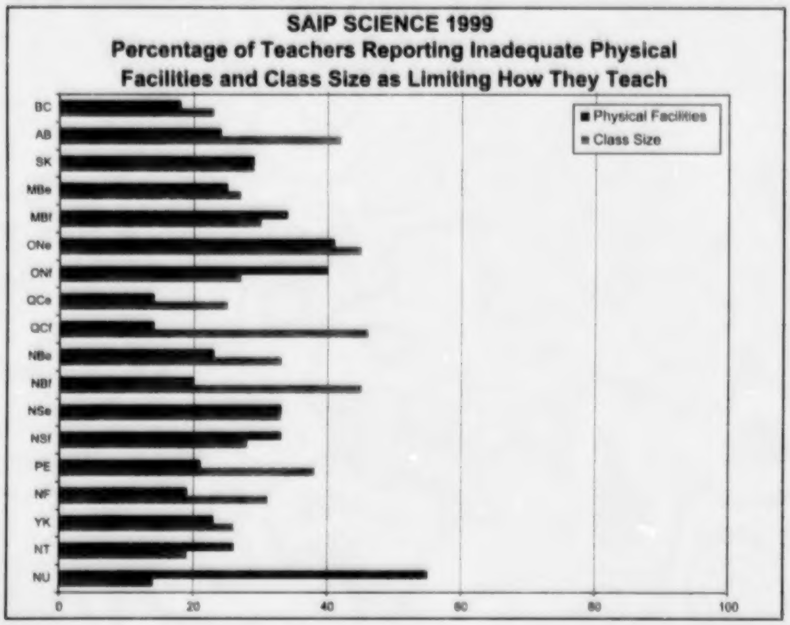


Limiting factors

	Lack of Computers %	*Lack of Lab Equipment* %
BC	25	22
AB	29	30
SK	28	34
MBe	30	29
MBf	55	43
ONe	37	44
ONf	54	47
QCe	18	15
QCf	25	19
NBe	30	29
NBf	32	34
NSe	42	44
NSf	40	46
PE	17	25
NF	29	32
YK	23	20
NT	31	42
NU	31	59

Chart 49

To what extent do inadequate physical facilities or large class size limit or restrict how you teach your science classes?

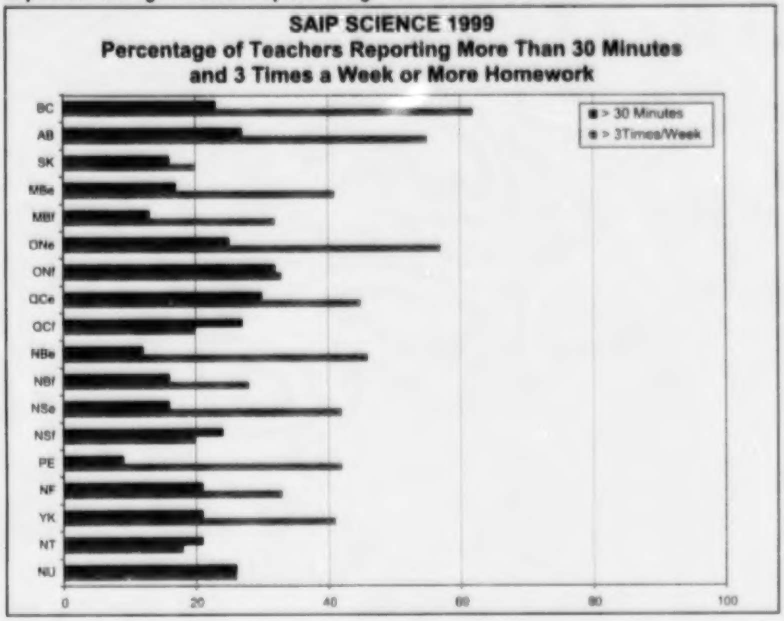


Limiting factors

	Physical Facilities %	*Class Size* %
BC	18	23
AB	24	42
SK	29	29
MBe	25	27
MBf	34	30
ONe	41	45
ONf	40	27
QCe	14	25
QCf	14	46
NBe	23	33
NBf	20	45
NSe	33	33
NSf	33	28
PE	21	38
NF	19	31
YK	23	26
NT	26	19
NU	55	14

Chart 50

How often do you usually assign homework in your science courses? If you assign science homework, how many minutes would you expect an average student to spend doing this work?



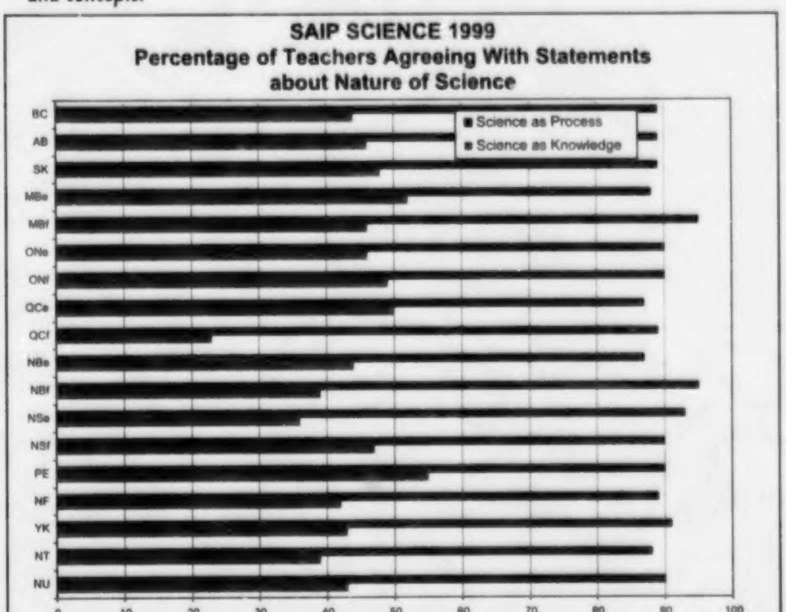
Frequency of homework assignment

	> 30 Minutes %	*> 3 Times/ Week* %
BC	23	62
AB	27	55
SK	16	20
MBe	17	41
MBf	13	32
ONe	25	57
ONf	32	33
QCe	30	45
QCf	27	20
NBe	12	46
NBf	16	28
NSe	16	42
NSf	24	20
PE	9	42
NF	21	33
YK	21	41
NT	21	18
NU	26	26

Chart 51

To what extent do you agree or disagree with each of the following statements?

Science is primarily a body of knowledge and concepts; science is better thought of as a process than as a body of knowledge and concepts.



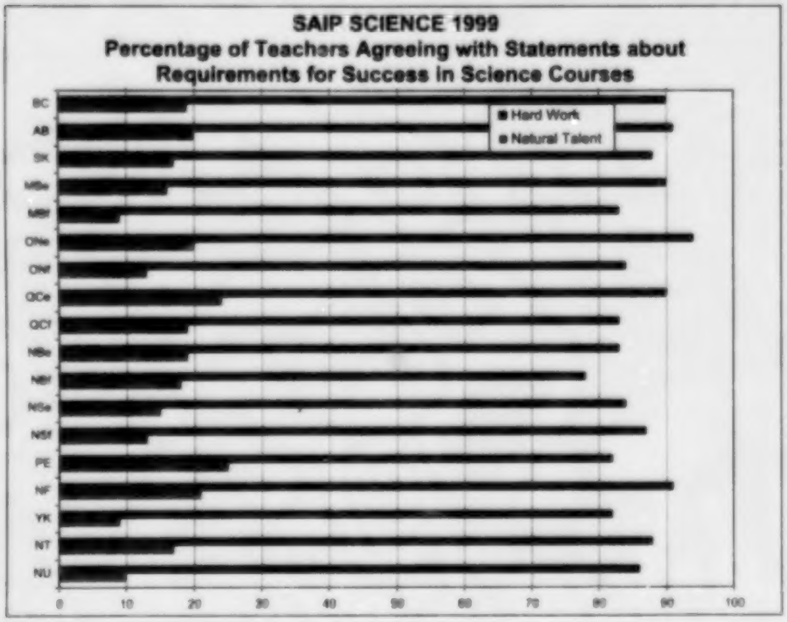
Statements about science

	Science as Process %	*Science as Knowledge* %
BC	89	44
AB	89	46
SK	89	48
MBe	88	52
MBf	95	46
ONe	90	46
ONf	90	49
QCe	87	50
QCf	89	23
NBe	87	44
NBf	95	39
NSe	93	36
NSf	90	47
PE	90	55
NF	89	42
YK	91	43
NT	88	39
NU	90	43

Chart 52

To what extent do you agree or disagree with each of the following statements?

Students need natural talent to do well in science; students need to work hard to do well in science courses.



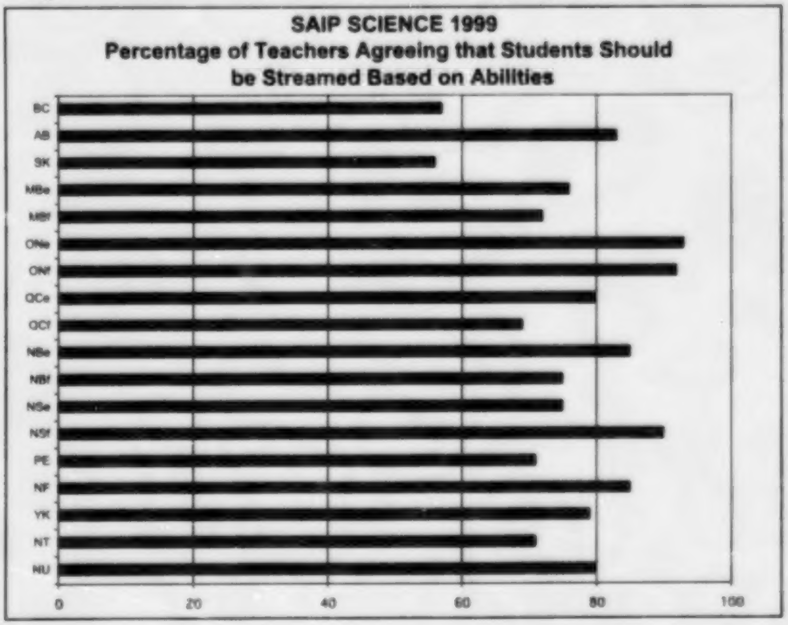
Attributes of success

	Hard Work %	*Natural Talent* %
BC	90	19
AB	91	20
SK	88	17
MBe	90	16
MBf	83	9
ONe	94	20
ONf	84	13
QCe	90	24
QCf	83	19
NBe	83	19
NBf	78	18
NSe	84	15
NSf	87	13
PE	82	25
NF	91	21
YK	82	9
NT	88	17
NU	86	10

Chart 53

To what extent do you agree or disagree with each of the following statements?

High school students should be streamed into different programs based on their abilities.



Streaming — agreement

	%
BC	57
AB	83
SK	56
MBe	76
MBf	72
ONe	93
ONf	92
QCe	80
QCf	69
NBe	85
NBf	75
NSe	75
NSf	90
PE	71
NF	85
YK	79
NT	71
NU	80

The student questionnaire contained 27 questions about student home backgrounds, educational and career aspirations, perceptions of school and science, out-of-school activities, attributions for success and failure, and classroom practices. Students were also asked additional questions about classroom practices and resources similar to those asked of teachers.

It is worth noting that, because of the size of the student samples in each jurisdiction, much narrower confidence intervals apply to the student data than to the school or teacher data. Generally, differences of plus or minus 5% can be taken to be statistically significant. However, as before, only larger differences are highlighted here as of possible importance for policy or practice.

In most cases, the charts in this section contain separate breakdowns for the two age groups. In a few cases, where there were no significant age differences, the two age groups have been combined.

Student Background

Charts 54 through 58 give some data on student backgrounds. As **Chart 54** indicates, only Ontario English, Quebec English, and British Columbia have more than 10% of their students born outside of Canada. All others are substantially lower, with the Eastern provinces in particular having no more than 1% or 2% of their students born outside the country.

The data on language spoken in the home, as shown in **Chart 55**, presents a somewhat different pattern. The language gap between home and school is actually much larger among francophone populations outside Quebec, except for New Brunswick, and in Nunavut than in jurisdictions with large numbers of immigrant children. For Manitoba francophone, this number includes students enrolled in a French-immersion program, whereas in other jurisdictions, immersion students wrote the assessment in English.

Percentages of 16-year-olds having parents at the lowest (less than high school completion) and highest (university graduation) levels of education are reported in **Charts 56 and 57**. (Thirteen-year-olds are omitted here because large numbers reported that they did not know their parents' level of education.) In general, more fathers than mothers were reported as having less than high school completion. This was especially true in the Eastern provinces. The picture is more mixed for university graduation, in both gender and geographical distribution, with no obvious pattern being evident.

Several questions were asked about possessions in the home that might be related to school work. The percentages of students reporting having a dictionary, encyclopaedia, calculator, and study desk were uniformly high. However, the proportions having computers and Internet connections were lower and more variable, as indicated by **Chart 58**.

Educational and Career Aspirations

Chart 59 shows the percentages of students indicating that they intend to pursue their education beyond high school. These figures are remarkably high and vary only slightly across jurisdictions. The most common specific destinations indicated by 16-year-olds — namely, university and trades or technology education — are shown in **Chart 60**. Again, the most notable feature is the high level of aspiration to university education. There is also a distinct, though not universal, English-French division here, with higher proportions of anglophone than francophone students indicating that they intend to pursue university studies and, conversely, higher proportions of francophone students opting for trades/technology training.

Students were asked more specifically to indicate whether they intended to pursue careers in science and technology. The responses are shown in **Chart 61**. Overall, approximately half of 16-year-olds reported that they were inclined in that direction. (Again, 13-year-olds have been omitted because of the large proportion of "don't know" responses.) While there remains an indication of an English-French division in these figures, with francophone students being slightly less inclined to science and technology careers than anglophone students, the overall proportions are more uniform here than for the actual educational levels to which students aspire.

Among specific fields within science and technology, the health field was uniformly the most widely chosen, averaging around 25%. This was followed by pure sciences, engineering and computer sciences, and technology, at approximately 20% each, with slightly greater differences across jurisdictions. Science or mathematics teaching was chosen by only 2% to 3% of respondents.

Perceptions of School and Science

Students were asked if they felt that doing well in school and in science was important to their parents, friends, teachers, and themselves. Generally high proportions (in excess of 75%) reported that parents thought it important or very important for them to do well in school. The opposite was true for friends, where the proportions were generally less than 20%. The results for teachers and students themselves are

presented in Charts **62 and 63**. In general, more 13-year-olds than 16-year-olds felt that their teachers think it is important for them to do well. Again, an English-French difference is apparent, with the proportions in francophone jurisdictions being generally lower than for anglophone jurisdictions. A similar, though less pronounced, age pattern is evident for students' own belief in the importance of doing well in school. In this case, the highest proportions generally occur in the francophone jurisdictions.

Student perceptions of belief by parents, science teachers, and themselves in the importance of their doing well in science are presented on **Charts 64 through 66**. The figures on doing well in science for parents and students themselves are generally much lower than those found for parents' and students' belief in the importance of doing well in school. The figures for science teachers are roughly comparable to those for all teachers. In all of these cases, an age difference is evident, with 13-year-olds expressing more positive perceptions than 16-year-olds. Differences between language groups are apparent for perceptions of science teacher beliefs, with more positive perceptions on the part of anglophone students. Regarding their own beliefs, however, the language differences tend to be in the opposite direction, as before.

Chart 67 shows the percentages of students agreeing with the proposition that science is an important school subject. Here the language differences are quite pronounced, with francophone students being much less likely than their anglophone counterparts to respond positively to this statement. Age differences are also apparent for francophones but generally not anglophones, with 16-year-olds in this case giving the more positive responses. As shown in **Chart 68**, almost exactly the same language difference is found for the statement that many good jobs require the study of science, with the exception that 13-year-olds gave the more positive responses for the francophone populations in this case.

Students were asked if they believe that science is more difficult than other school subjects. The results are shown in **Chart 69**. Generally speaking, about half the students agreed with this proposition, with 16-year-olds more likely to agree than 13-year-olds. In a couple of related questions, there was almost universal agreement with the proposition that students learn lots of new things in science and strong disagreement with the negative proposition that science does more harm than good in the world.

Student Activities

Students were asked a number of questions about activities related to their school work. Only small percentages reported taking extra school lessons or being tutored, as shown in **Chart 70**. **Chart 71** indicates that generally less than half the students spend one hour or more per week doing science homework, with these percentages being higher for 16-year-olds than for the younger students. As might be expected, more time is reported spent on homework in other subjects combined, as shown in **Chart 72**. In this case, francophone students, with the exception of those in Quebec, appear to spend less time on homework than anglophone students. Finally, **Chart 73** gives the proportions using a computer for school work. Altogether, about half the students reported such use. Here, there are substantial differences across jurisdictions, with the highest rates occurring in Ontario and the lowest in Nunavut.

Motivation and Attributions

Questions in this cluster had to do with whom students would turn to for help with difficult problems in science, and their attributions of success or failure.

Altogether, more than 90% of students throughout agreed that they would ask their teachers for help with difficult science problems. The figures were also uniformly high, at about 75%, for asking friends. As for asking parents, as **Chart 74** shows, age differences are quite pronounced, with many more 13-year-olds than 16-year-olds agreeing that they would ask their parents. Again, francophone students appear less likely than anglophones to ask their parents for help, although the tendency is not as pronounced here as for some other questions.

A measure of motivation is the degree to which students would persist in working at a difficult problem. The percentages of students agreeing with the proposition that they would keep trying a difficult problem until it is solved is given in **Chart 75**. These figures are generally quite high, with 16-year-olds exhibiting slightly more persistence than 13-year-olds. While a few of the francophone populations show lower persistence than others, the language difference is not consistent in this case.

The percentages of students reporting that natural talent is needed to do well in science are presented in **Chart 76**. First, it is interesting to note that students generally express stronger belief in natural talent than their teachers. Second, a

distinct language difference is evident here, with more anglophone than francophone students believing that natural talent is important. The age difference is also substantial in this case, with 16-year-olds expressing stronger belief in natural talent than 13-year-olds.

On other questions about factors affecting performance in science, there was strong agreement throughout that hard work and encouragement from teachers are required. On the other hand, most students disagreed with the proposition that good luck is a requirement.

More specifically, students were asked about the part played by study, teacher marking, luck, course difficulty, and quality of teaching as factors affecting either unusually high or low marks in science courses. More than 80% of students throughout agreed that exceptionally good marks could be attributed to working especially hard and low marks to not working hard enough. Only 30% to 35% tended to agree that high or low marks were due to easy or hard teacher marking.

Charts 77 and 78 show areas in which age or language differences in responses were evident. It is clear from Chart 77 that 16-year-olds are more likely than 13-year-olds to attribute bad marks to the course being not well taught. The exception is Nunavut students, where the reverse is true. Language differences are also evident here, particularly at the 13-year-old level. An even stronger language effect is apparent for the proposition that getting an unusually high mark is the result of good luck. While the proportions agreeing with this proposition are generally fairly small, they are much higher for four of the five francophone populations than for the anglophone populations. The exception in this, as in some other questions, is Quebec francophones, whose responses are closer to the general pattern. Students in Nunavut stand out as similar to the francophone populations in attributing high marks to good luck.

As a final question in this section, students were asked how satisfied they are with their science marks. The percentages satisfied and very satisfied appear in **Chart 79**. An age pattern is apparent here, with 13-year-olds being more satisfied than 16-year-olds. This follows the pattern of actual reported marks, as shown in **Chart 80**, with 13-year-olds generally reporting receiving higher marks than 16-year-olds. Across jurisdictions, satisfaction is also highly correlated with actual reported marks.

Quality of School Life

Students were asked to respond to a 15-item agree-disagree scale, containing a series of propositions about the quality of their school life. Generally, the responses showed a pattern of highly positive feelings about school. More than 90% of students agreed that they have a lot of friends in school. Generally, more than 80% reported that they get along with most other students, that people in the school respect them, that teachers treat them fairly and give them the marks they deserve, that they enjoy going to school, and, finally, that they know how to cope with school work.

A few additional items showed more mixed feelings or differences between language or age groups. Results for these items are summarized in Charts 81 through 84. **Chart 81** indicates that close to 80% of students in general reported that they feel good about school. However, the percentages are substantially lower for francophone than for anglophone populations. The pattern of less satisfaction on the part of francophone students is also supported by responses to the statement "I am bossed around too much in school" in **Chart 82**, where the proportions of agreement are generally low but are much higher for francophone students. Despite these two more negative views on the part of francophones, the statement "I am usually bored in school," shown in **Chart 83**, yielded an opposite trend, with greater agreement for anglophone than for francophone students. The more negative tendency for francophones again appears in **Chart 84**, in response to the statement "I am genuinely interested in school work." However, in this case, the differences are not as great, and the Ontario francophone population, in particular, shows a fairly strong age division favouring 13-year-olds as compared to others.

Finally, it is interesting to note that what appears to be more negative perceptions of the quality of school life on the part of francophone students does not manifest itself in higher absenteeism. As **Chart 85** shows, francophone students are generally less likely than anglophones to report being absent for three or more days in the school year. An age difference is observable here, with more 16-year-olds than 13-year-olds reporting three or more days' absence.

Interaction with Parents

Students were asked how often they work with their parents on science and other homework and how often they discuss various matters related to school work with their parents. The

results for science homework are reported in **Chart 86**. Here, the age differences are most obvious, with a higher proportion of 13-year-olds reporting working with their parents on science homework a few times a month or more. In general, francophone populations also show higher percentages than anglophones, especially at the 13-year-old level.

The results for students discussing their futures with parents appear in **Chart 87**. Here the percentages are quite high, with age differences in the opposite direction to those for working with their parents on homework. That is, higher proportions of 16-year-olds reported discussing their futures with parents.

All other items in this set yielded high levels of response, indicating that most students interact frequently with their parents in matters of school work and related activities.

Classroom Activities and Resource Use

The questions asked of students about classroom activities were closely parallel to those asked of teachers. Generally speaking, student responses appear to be consistent with those of teachers. However, a more detailed comparison is needed before this can be used as an indicator of the reliability of these types of reports. Teacher responses have been summarized briefly in the teacher section. At this point, we will confine ourselves to highlighting a few activities that appear to show age or language differences, as reported by students.

Chart 88 gives the percentages of students reporting that their teachers give notes a few times a week or more. As reported for teachers, this indicates that note giving is a highly prevalent classroom activity. Age differences are apparent here, with note taking being more common at the 16-year-old level.

The prevalence of textbook study is shown in **Chart 89**. This activity is somewhat less prevalent than note giving and shows greater variation across populations. Generally, more textbook study is reported by 13-year-olds, the exception being in Ontario, where the reverse is true.

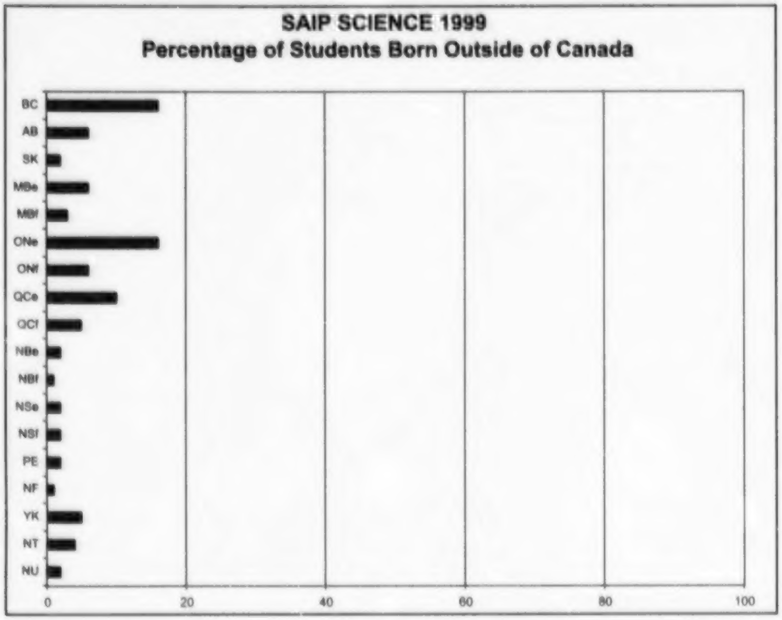
Chart 90 gives the percentages reporting doing laboratory experiments a few times a week or more. Again, the pattern here is quite consistent with that reported by teachers, with more experimenting being conducted in the larger provinces and in the Yukon than elsewhere. Thirteen-year-olds reported more experimenting than 16-year-olds, except in Ontario, where, as in prevalence of textbook study, the reverse holds.

Chart 91 indicates the prevalence of noise or disruption in classrooms, as perceived by students. The age difference is most obvious here with 13-year-olds reporting noise/disruption more often than 16-year-olds. Fairly large differences exist across jurisdictions but in no obvious pattern.

Results for a selection of the items on resource use are presented in **Charts 92, 93, and 94**. The pattern for science books and magazines shows relatively infrequent use and strong language differences, with francophone students reporting use of science books and magazines much less frequently than anglophone students. Similar results were found for teacher responses to the same item. Computer use is even less prevalent, but is reported to be somewhat more prevalent for 13-year-olds than for 16-year-olds. The notable spikes in the chart for Ontario French, Nunavut, and the Northwest Territories are not replicated in the teacher responses and therefore should be treated as anomalies in the data. Finally, the results for overhead projector use show substantial variability, with such use being much less frequent in Quebec, Newfoundland and Labrador, and the Nova Scotia francophone population than elsewhere.

Chart 54

Were you born in Canada?

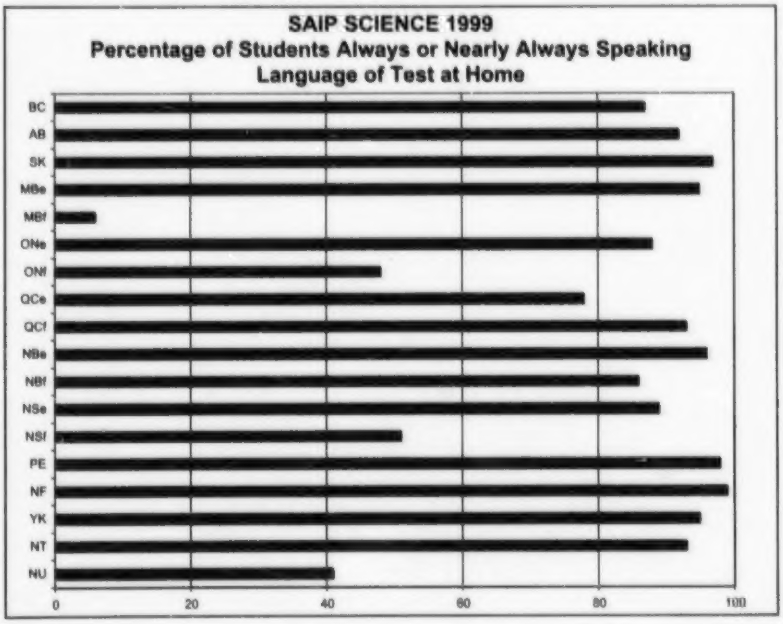


Students born outside of Canada

	%
BC	16
AB	6
SK	2
MBe	6
MBf	3
ONe	16
ONf	6
QCe	10
QCf	5
NBe	2
NBf	1
NSe	2
NSf	2
PE	2
NF	1
YK	5
NT	4
NU	2

Chart 55

How often do you speak English (French) at home?

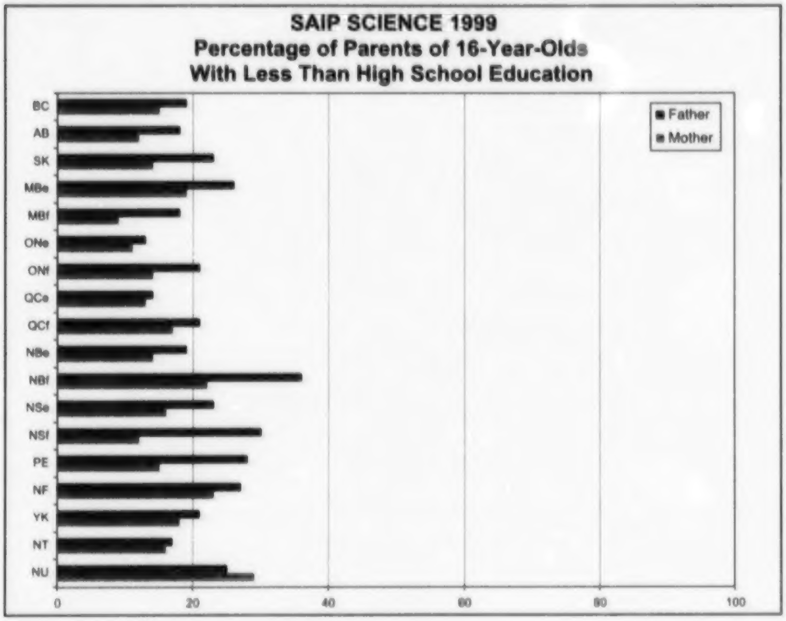


Language of test spoken at home

	%
BC	87
AB	92
SK	97
MBe	95
MBf	6
ONe	88
ONf	48
QCe	78
QCf	93
NBe	96
NBf	86
NSe	89
NSf	51
PE	98
NF	99
YK	95
NT	93
NU	41

Chart 56

How far in school did your mother and father go (less than high school completion)?

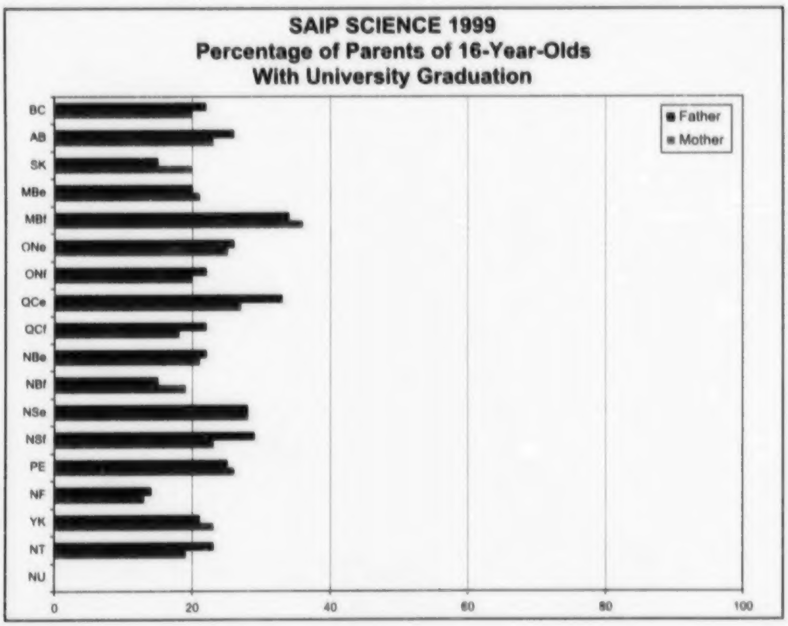


Parental education —
Less than high school education: Age 16

	Father %	*Mother* %
BC	19	15
AB	18	12
SK	23	14
MBe	26	19
MBf	18	9
ONe	13	11
ONf	21	14
QCe	14	13
QCf	21	17
NBe	19	14
NBf	36	22
NSe	23	16
NSf	30	12
PE	28	15
NF	27	23
YK	21	18
NT	17	16
NU	25	29

Chart 57

How far in school did your mother and father go [completed university degree(s)]?

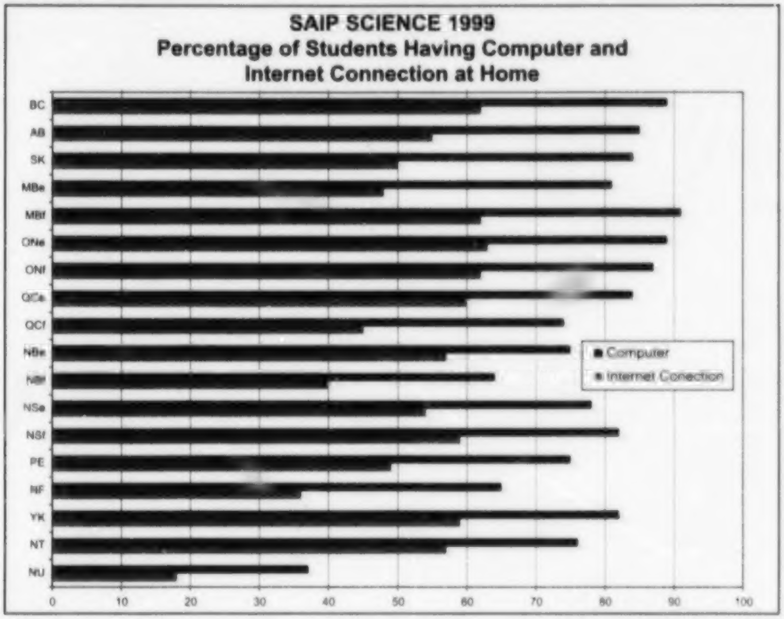


Parental education —
University completion: Age 16

	Father	*Mother*
BC	22	20
AB	26	23
SK	15	20
MBe	20	21
MBf	34	36
ONe	26	25
ONf	22	20
QCe	33	27
QCf	22	18
NBe	22	21
NBf	15	19
NSe	28	28
NSf	29	23
PE	25	26
NF	14	13
YK	21	23
NT	23	19
NU		

Chart 58

Do you have these things in your home — computer, Internet connection?

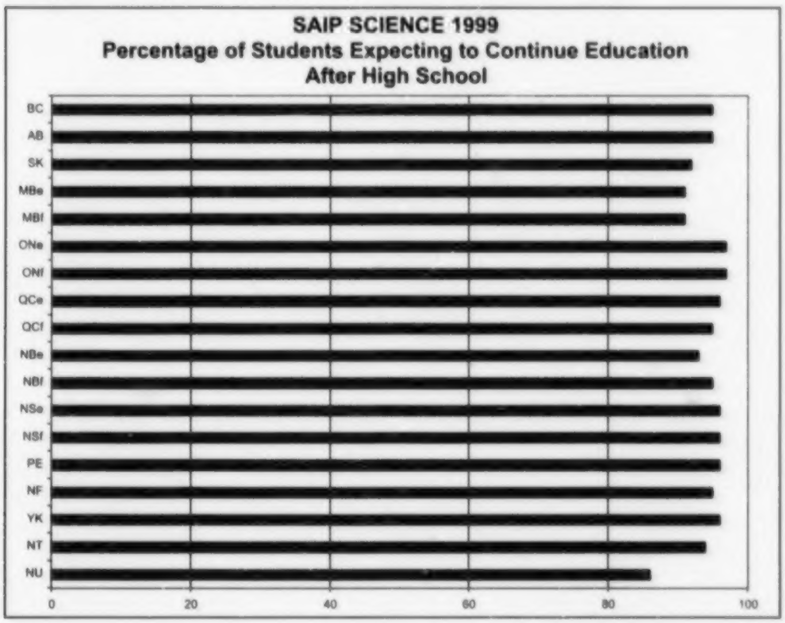


Computer or Internet at home

	Computer %	*Internet Connection* %
BC	89	62
AB	85	55
SK	84	50
MBe	81	48
MBf	91	62
ONe	89	63
ONf	87	62
QCe	84	60
QCf	74	45
NBe	75	57
NBf	64	40
NSe	78	54
NSf	82	59
PE	75	49
NF	65	36
YK	82	59
NT	76	57
NU	37	18

Chart 59

After you finish high school, do you expect to continue your education?

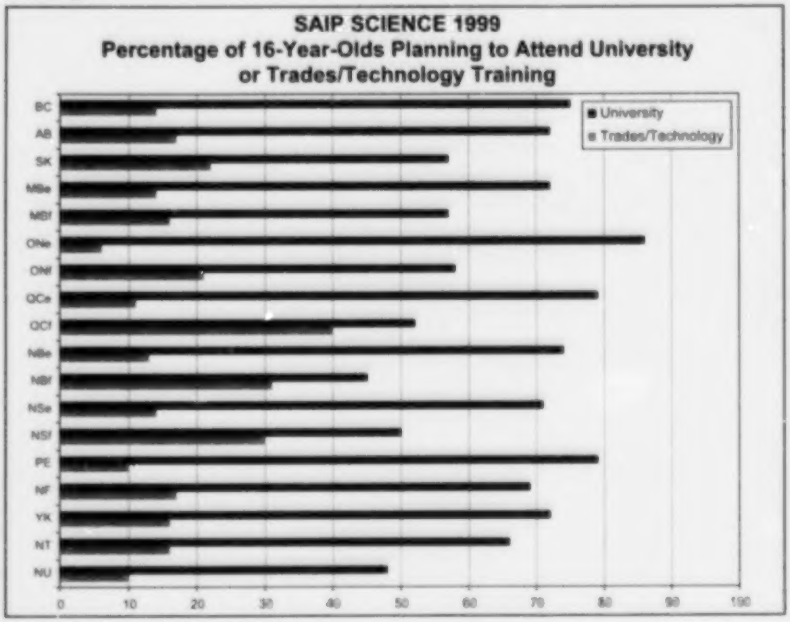


Expectations of continuing education

	%
BC	95
AB	95
SK	92
MBe	91
MBf	91
ONe	97
ONf	97
QCe	96
QCf	95
NBe	93
NBf	95
NSe	96
NSf	96
PE	96
NF	95
YK	96
NT	94
NU	86

Chart 60

What form of further education do you intend to take — specialized work or trade training, technical or technology training, university or college?

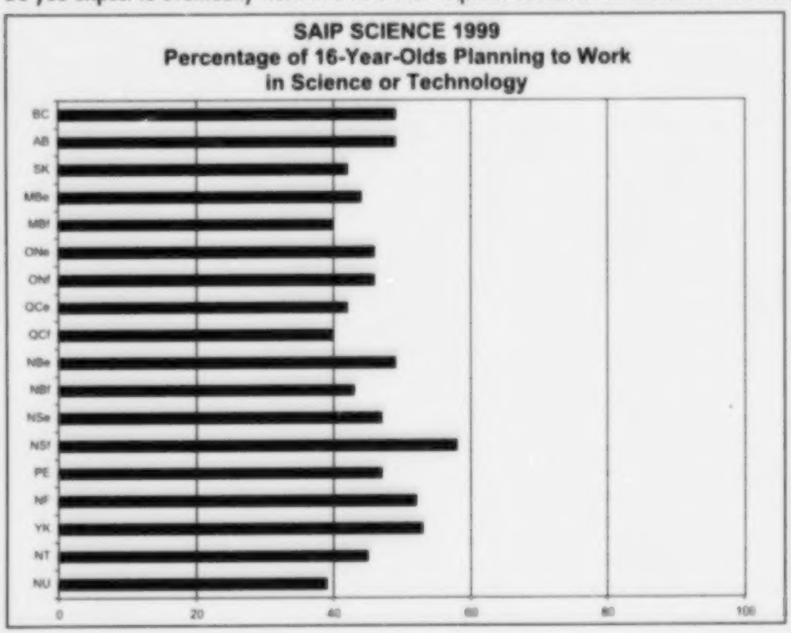


Education orientation

	University %	Trades/Technology %
BC	75	14
AB	72	17
SK	57	22
MBe	72	14
MBf	57	16
ONe	86	6
ONf	58	21
QCe	79	11
QCf	52	40
NBe	74	13
NBf	45	31
NSe	71	14
NSf	50	30
PE	79	10
NF	69	17
YK	72	16
NT	66	16
NU	48	10

Chart 61

Do you expect to eventually work in a field that requires education in science or technology?

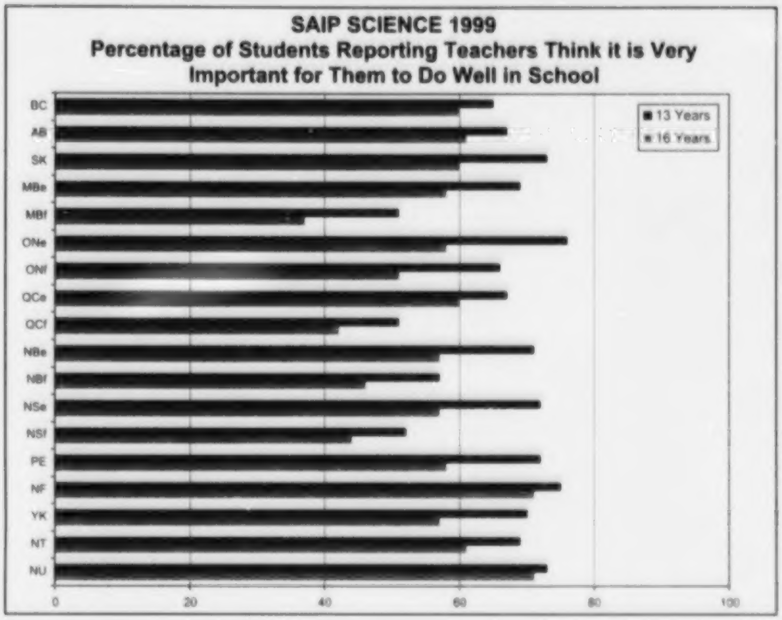


Plan to work in science/technology

	%
BC	49
AB	49
SK	42
MBe	44
MBf	40
ONe	46
ONf	46
QCe	42
QCf	40
NBe	49
NBf	43
NSe	47
NSf	58
PE	47
NF	52
YK	53
NT	45
NU	39

Chart 62

How important do your teachers think it is for you to do well in school?

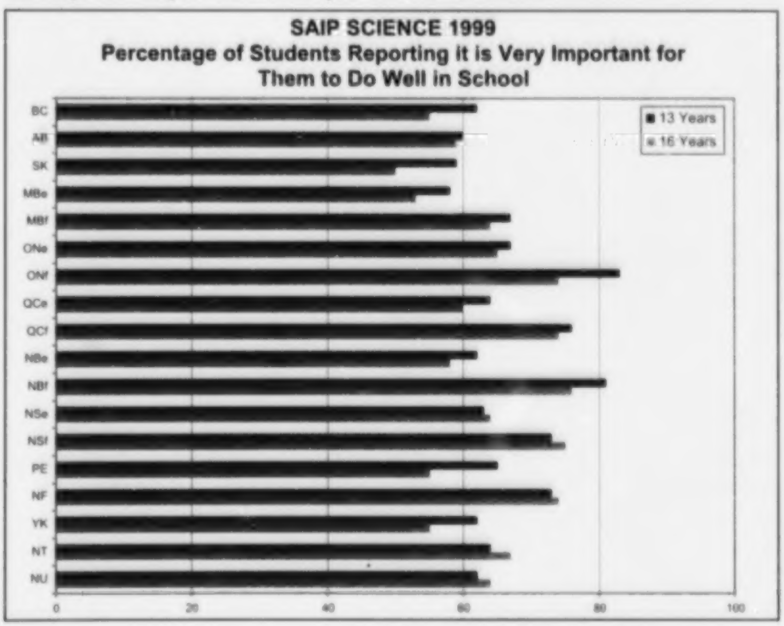


Teacher opinion about student success in school

	13 Years %	*16 Years* %
BC	65	60
AB	67	61
SK	73	60
MBe	69	58
MBf	51	37
ONe	76	58
ONf	66	51
QCe	67	60
QCf	51	42
NBe	71	57
NBf	57	46
NSe	72	57
NSf	52	44
PE	72	58
NF	75	71
YK	70	57
NT	69	61
NU	73	71

Chart 63

How important do you think it is for you to do well in school?

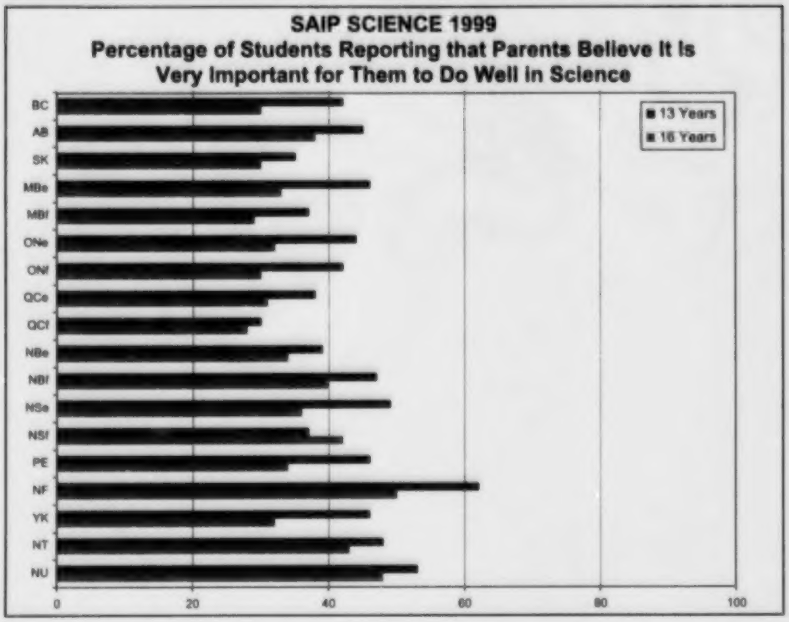


Student opinion about success in school

	13 Years %	*16 Years* %
BC	62	55
AB	60	59
SK	59	50
MBe	58	53
MBf	67	64
ONe	67	65
ONf	83	74
QCe	64	60
QCf	76	74
NBe	62	58
NBf	81	76
NSe	63	64
NSf	73	75
PE	65	55
NF	73	74
YK	62	55
NT	64	67
NU	62	64

Chart 64

How important do your parents think it is for you to do well in science?

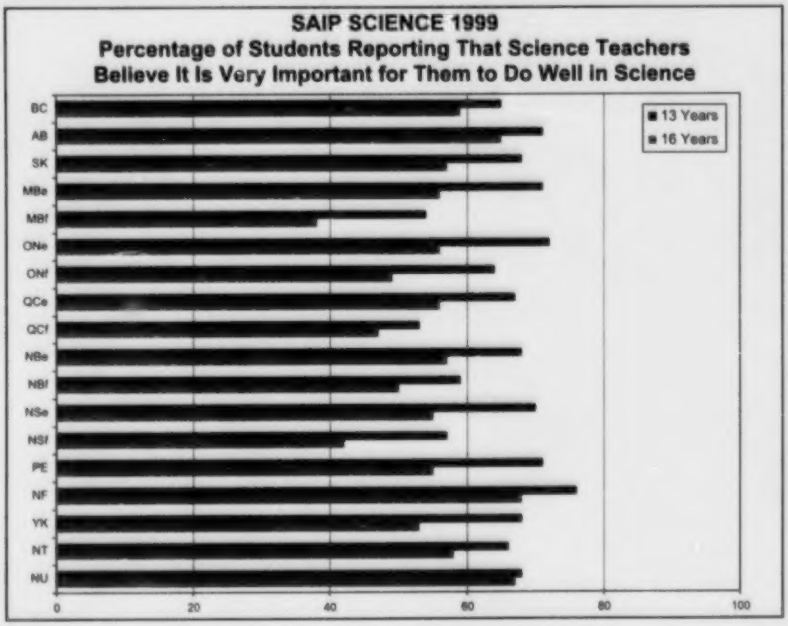


Parent opinion about success in science

	13 Years %	16 Years %
BC	42	30
AB	45	38
SK	35	30
MBe	46	33
MBf	37	29
ONe	44	32
ONf	42	30
QCe	38	31
QCf	30	28
NBe	39	34
NBf	47	40
NSe	49	36
NSf	37	42
PE	46	34
NF	62	50
YK	46	32
NT	48	43
NU	53	48

Chart 65

How important do your science teachers think it is for you to do well in science?

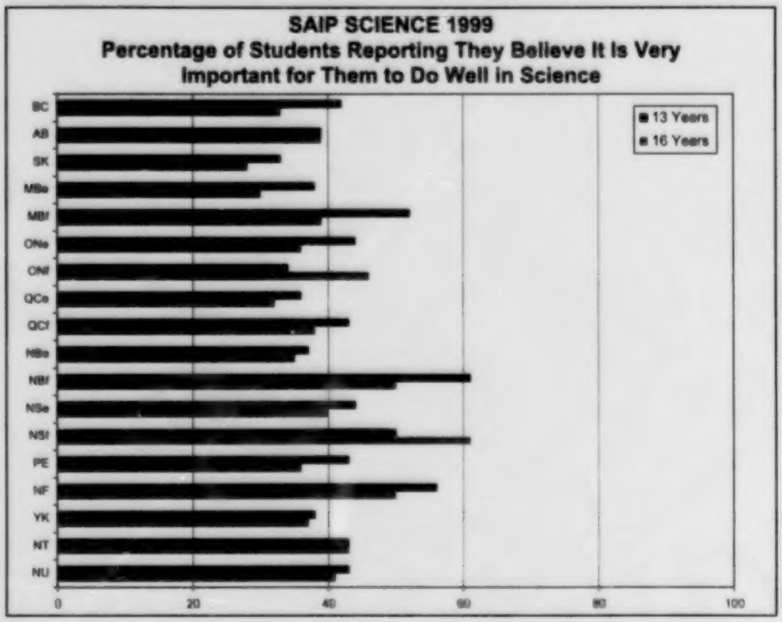


Teacher opinion about success in science

	13 Years %	16 Years %
BC	65	59
AB	71	65
SK	68	57
MBe	71	56
MBf	54	38
ONe	72	56
ONf	64	49
QCe	67	56
QCf	53	47
NBe	68	57
NBf	59	50
NSe	70	55
NSf	57	42
PE	71	55
NF	76	68
YK	68	53
NT	66	58
NU	68	67

Chart 66

How important do you think it is for you to do well in science?

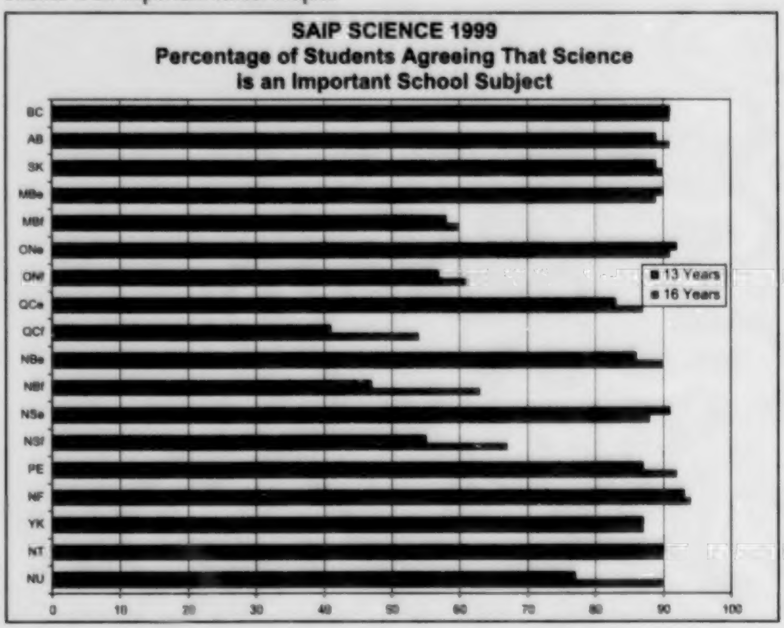


Student opinion about success in science

	13 Years %	16 Years %
BC	42	33
AB	39	39
SK	33	28
MBe	38	30
MBf	52	39
ONe	44	36
ONf	34	46
QCe	36	32
QCf	43	38
NBe	37	35
NBf	61	50
NSe	44	40
NSf	50	61
PE	43	36
NF	56	50
YK	38	37
NT	43	43
NU	43	41

Chart 67

Science is an important school subject.

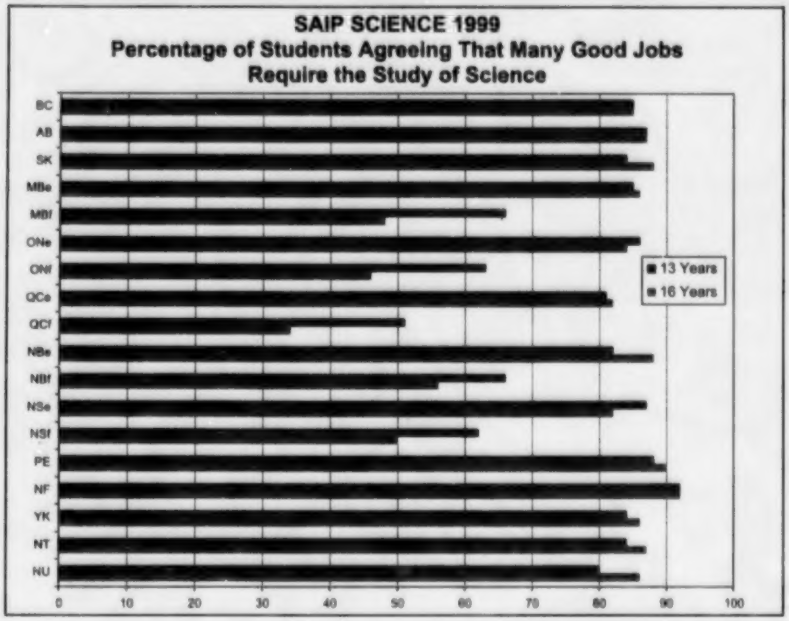


Student opinion about importance of science

	13 Years %	16 Years %
BC	91	91
AB	89	91
SK	89	90
MBe	90	89
MBf	58	60
ONe	92	91
ONf	57	61
QCe	83	87
QCf	41	54
NBe	86	90
NBf	47	63
NSe	91	88
NSf	55	67
PE	87	92
NF	93	94
YK	87	87
NT	90	90
NU	77	90

Chart 68

Many good jobs require the study of science.

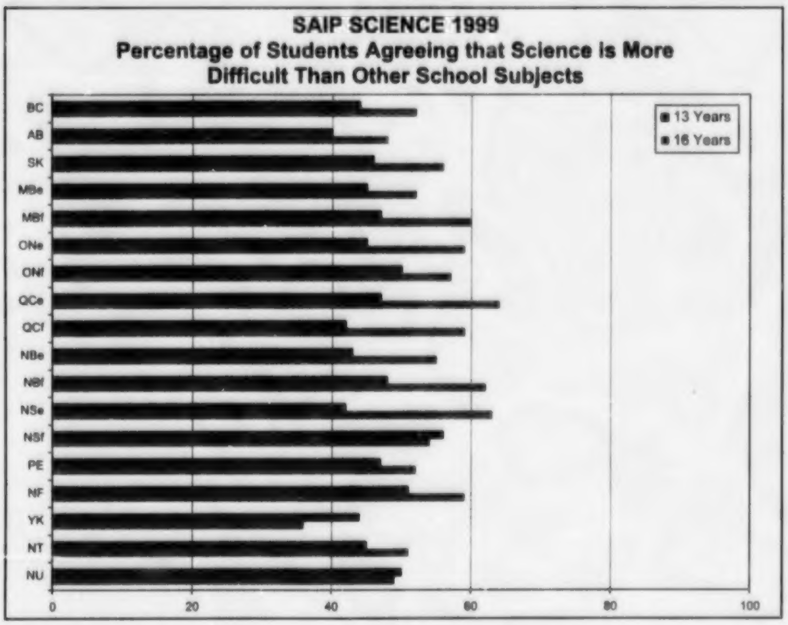


Importance of science to a good job

	13 Years %	16 Years %
BC	85	85
AB	87	87
SK	84	88
MBe	85	86
MBf	66	48
ONe	86	84
ONf	63	46
QCe	81	82
QCf	51	34
NBe	82	88
NBf	66	56
NSe	87	82
NSf	62	50
PE	88	90
NF	92	92
YK	84	86
NT	84	87
NU	80	86

Chart 69

Science is more difficult than other school subjects.

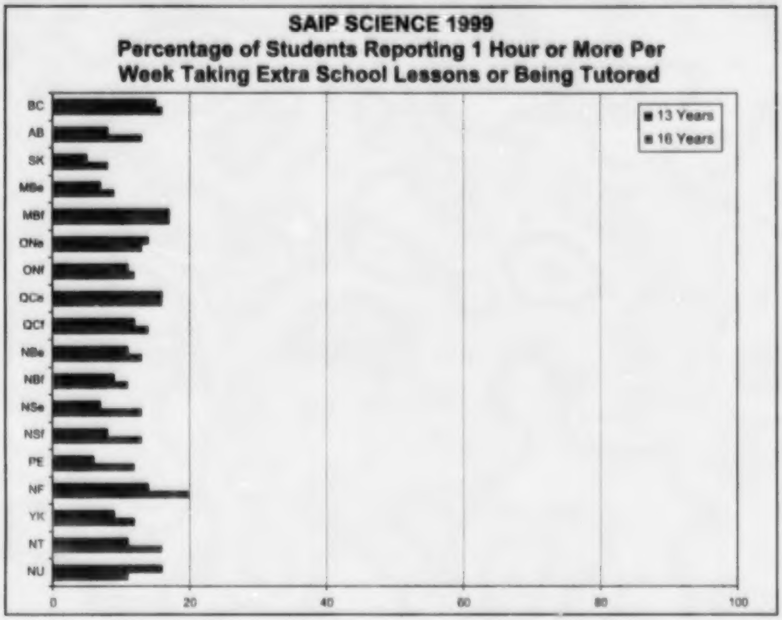


Science more difficult than other subjects

	13 Years %	16 Years %
BC	44	52
AB	40	48
SK	46	56
MBe	45	52
MBf	47	60
ONe	45	59
ONf	50	57
QCe	47	64
QCf	42	59
NBe	43	55
NBf	48	62
NSe	42	63
NSf	56	54
PE	47	52
NF	51	59
YK	44	36
NT	45	51
NU	50	49

Chart 70

In a normal week (including the weekend) how much time do you usually spend taking extra school lessons or having tutoring?

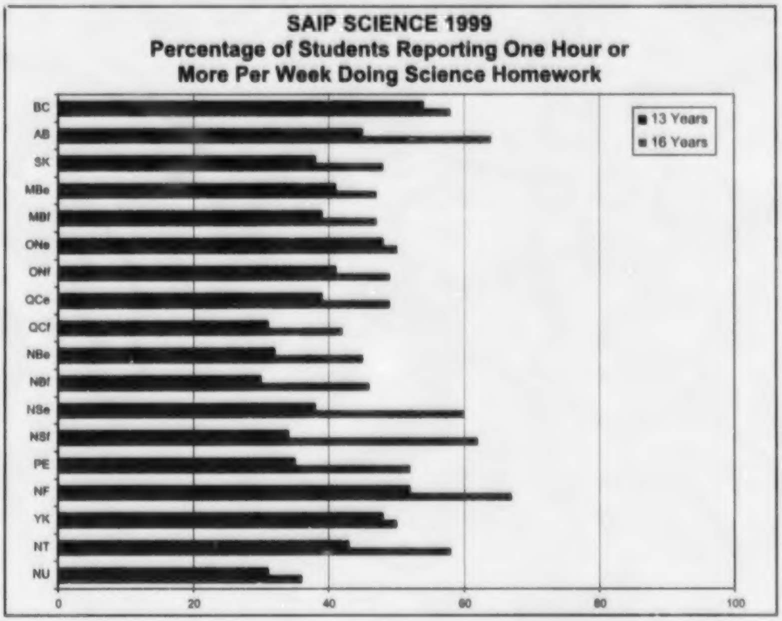


Students taking extra lessons

	13 Years %	16 Years %
BC	15	16
AB	8	13
SK	5	8
MBe	7	9
MBf	17	17
ONe	14	13
ONf	11	12
QCe	16	16
QCf	12	14
NBe	11	13
NBf	9	11
NSe	7	13
NSf	8	13
PE	6	12
NF	14	20
YK	9	12
NT	11	16
NU	16	11

Chart 71

In a normal week (including the weekend) how much time do you usually spend studying or doing homework in science?

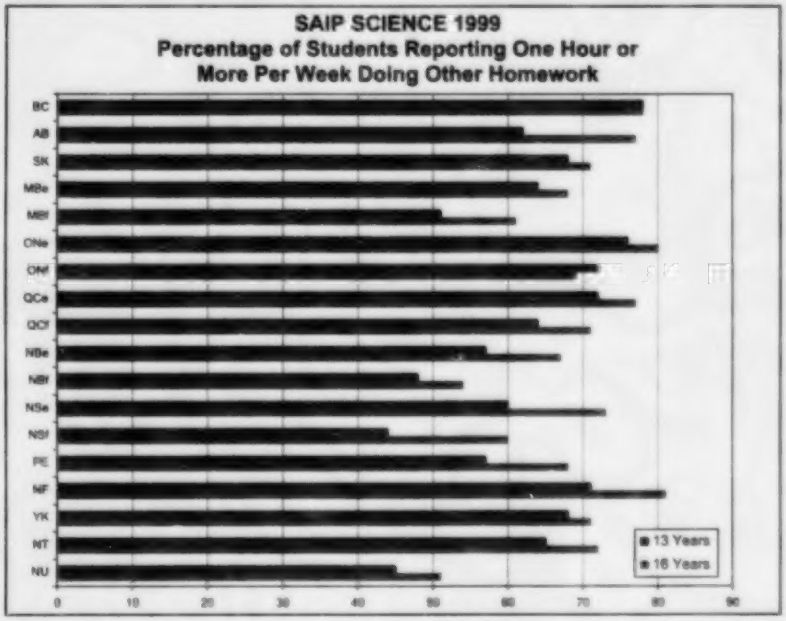


Students doing extra science work

	13 Years %	16 Years %
BC	54	58
AB	45	64
SK	38	48
MBe	41	47
MBf	39	47
ONe	48	50
ONf	41	49
QCe	39	49
QCf	31	42
NBe	32	45
NBf	30	46
NSe	38	60
NSf	34	62
PE	35	52
NF	52	67
YK	48	50
NT	43	58
NU	31	36

Chart 72

In a normal week (including the weekend) how much time do you usually spend studying or doing homework in other subjects?

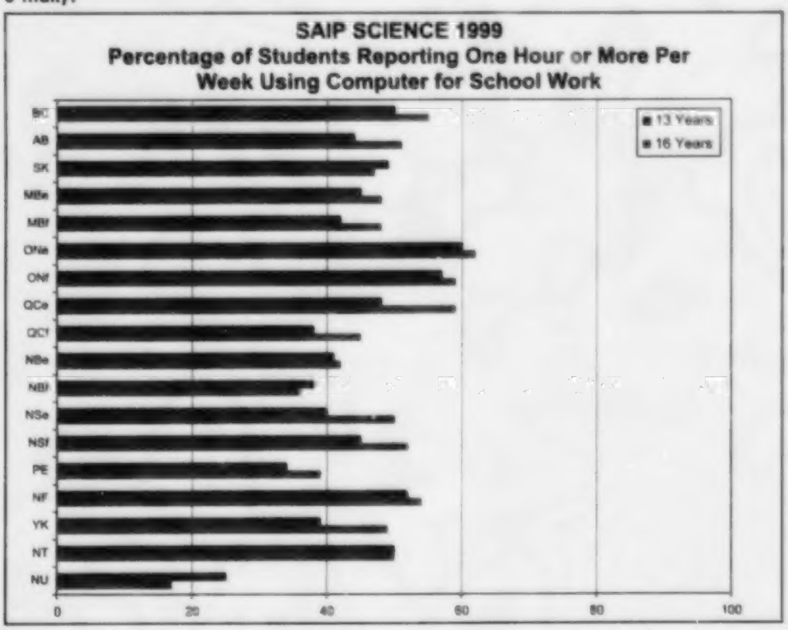


Students doing other homework

	13 Years %	16 Years %
BC	78	78
AB	62	77
SK	68	71
MBe	64	68
MBf	51	61
ONe	76	80
ONf	72	69
QCe	72	77
QCf	64	71
NBe	57	67
NBf	48	54
NSe	60	73
NSf	44	60
PE	57	68
NF	71	81
YK	68	71
NT	65	72
NU	45	51

Chart 73

In a normal week (including the weekend) how much time do you usually spend using a computer for school purposes (e.g., research, e-mail)?

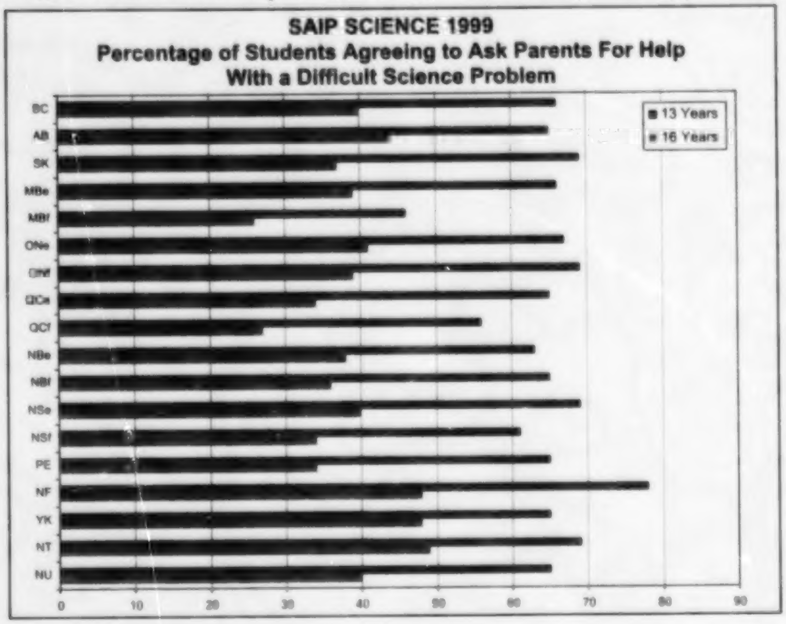


Students using computer for school

	13 Years %	16 Years %
BC	50	55
AB	44	51
SK	49	47
MBe	45	48
MBf	42	48
ONe	60	62
ONf	57	59
QCe	48	59
QCf	38	45
NBe	41	42
NBf	38	36
NSe	40	50
NSf	45	52
PE	34	39
NF	52	54
YK	39	49
NT	50	50
NU	25	17

Chart 74

If I were faced with a difficult problem in science, I would be likely to ask my parents for help.

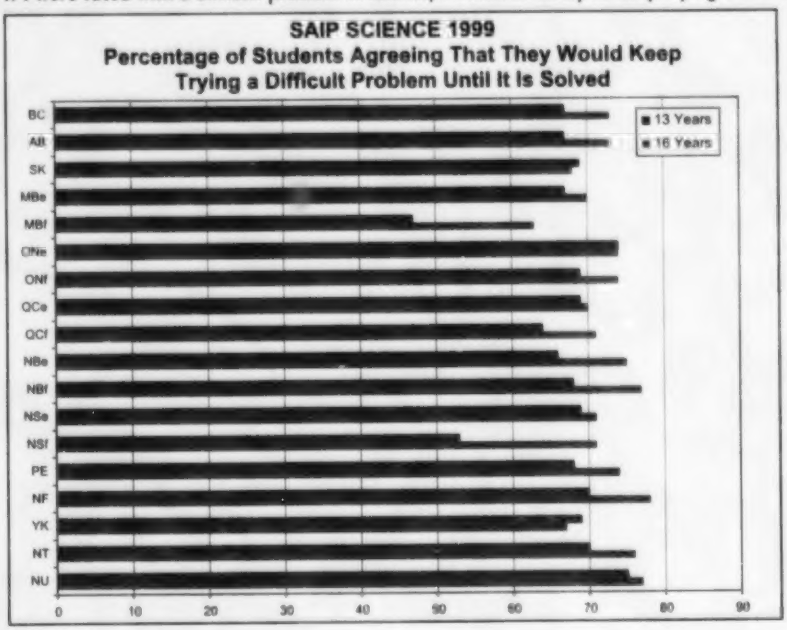


Students asking parents for help in science

	13 Years %	16 Years %
BC	66	40
AB	65	44
SK	69	37
MBe	66	39
MBf	46	26
ONe	67	41
ONf	69	39
QCe	65	34
QCf	56	27
NBe	63	38
NBf	65	36
NSe	69	40
NSf	61	34
PE	65	34
NF	78	48
YK	65	48
NT	69	49
NU	65	40

Chart 75

If I were faced with a difficult problem in science, I would be likely to keep trying until I solved the problem.

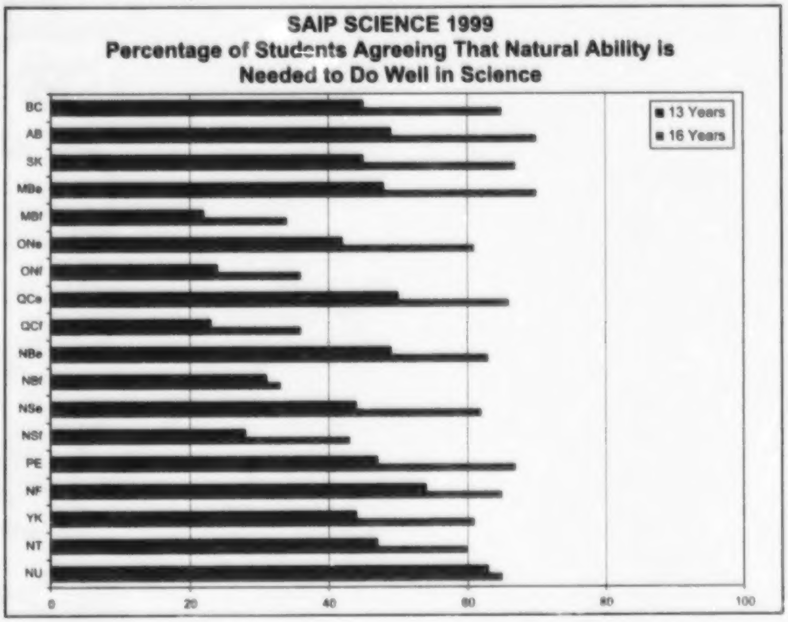


Students who keep trying

	13 Years %	16 Years %
BC	67	73
AB	67	73
SK	69	68
MBe	67	70
MBf	47	63
ONe	74	74
ONf	69	74
QCe	69	70
QCf	64	71
NBe	66	75
NBf	68	77
NSe	69	71
NSf	53	71
PE	68	74
NF	70	78
YK	69	67
NT	70	76
NU	75	77

Chart 76

To do well in science you need natural ability.

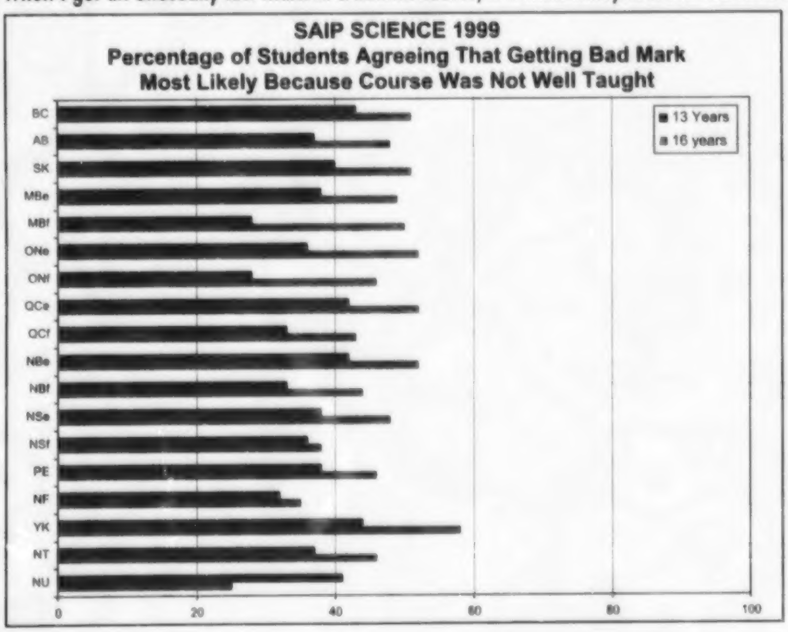


Student opinion about success in science (natural ability)

	13 Years %	*16 Years* %
BC	45	65
AB	49	70
SK	45	67
MBe	48	70
MBf	22	34
ONe	42	61
ONf	24	36
QCe	50	66
QCf	23	36
NBe	49	63
NBf	31	33
NSe	44	62
NSf	28	43
PE	47	67
NF	54	65
YK	44	61
NT	47	60
NU	63	65

Chart 77

When I get an unusually low mark in a science course, it is most likely because the course was not well taught.

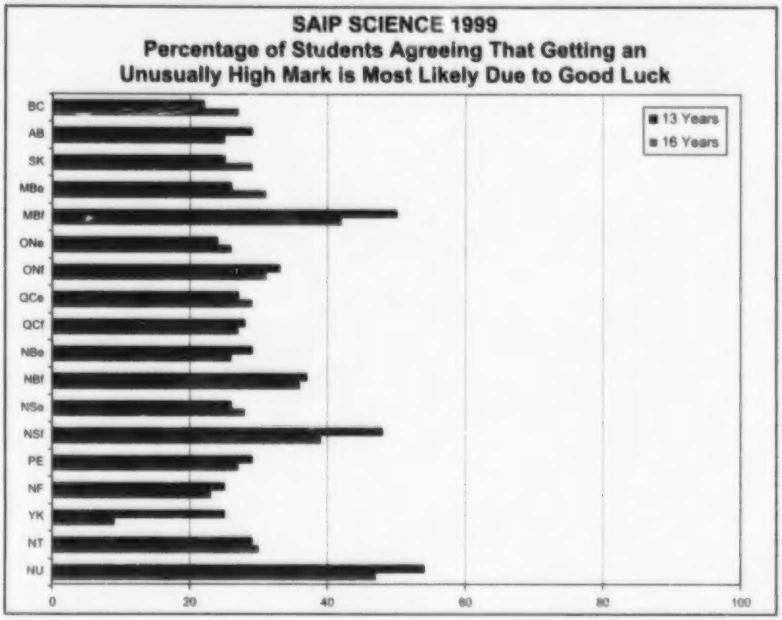


Student opinion about poor performance (poor teaching)

	13 Years %	*16 years* %
BC	43	51
AB	37	48
SK	40	51
MBe	38	49
MBf	28	50
ONe	36	52
ONf	28	46
QCe	42	52
QCf	33	43
NBe	42	52
NBf	33	44
NSe	38	48
NSf	36	38
PE	38	46
NF	32	35
YK	44	58
NT	37	46
NU	41	25

Chart 78

When I get an unusually high mark in a science course, it is most likely because of good luck.

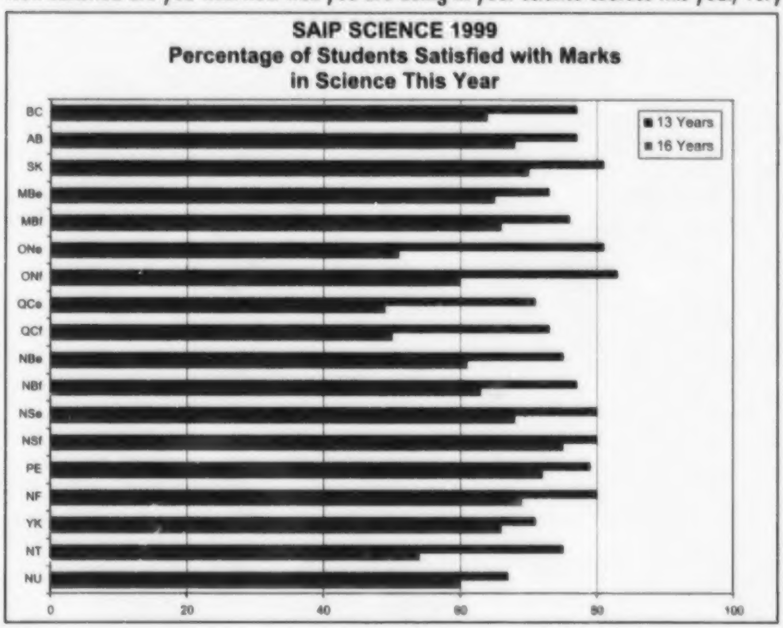


Student opinion about success in science (good luck)

	13 Years %	*16 Years* %
BC	22	27
AB	29	25
SK	25	29
MBe	26	31
MBf	50	42
ONe	24	26
ONf	33	31
QCe	27	29
QCf	28	27
NBe	29	26
NBf	37	36
NSe	26	28
NSf	48	39
PE	29	27
NF	25	23
YK	25	9
NT	29	30
NU	54	47

Chart 79

How satisfied are you with how well you are doing in your science courses this year, very satisfied or satisfied?

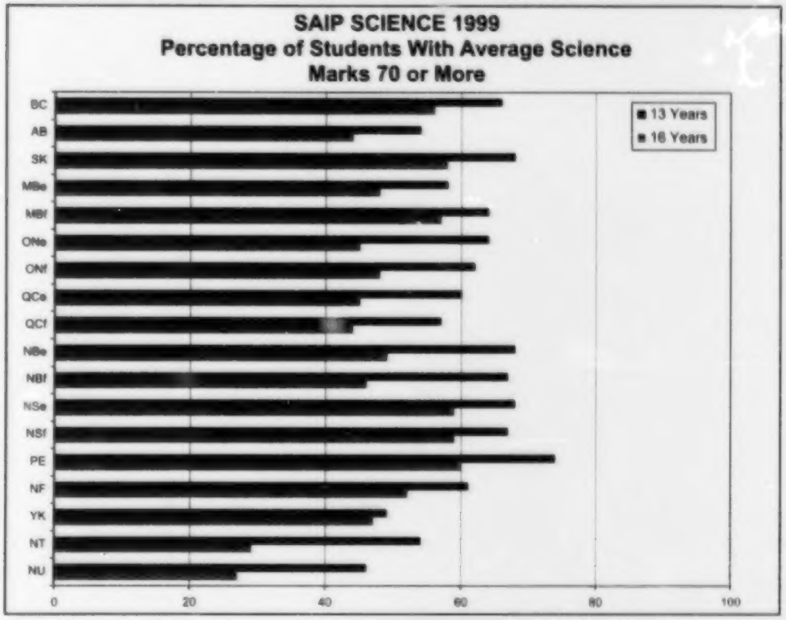


Students satisfied with marks

	13 Years %	*16 Years* %
BC	77	64
AB	77	68
SK	81	70
MBe	73	65
MBf	76	66
ONe	81	51
ONf	83	60
QCe	71	49
QCf	73	50
NBe	75	61
NBf	77	63
NSe	80	68
NSf	80	75
PE	79	72
NF	80	69
YK	71	66
NT	75	54
NU	67	60

Chart 80

What is your average mark in your science courses this year?

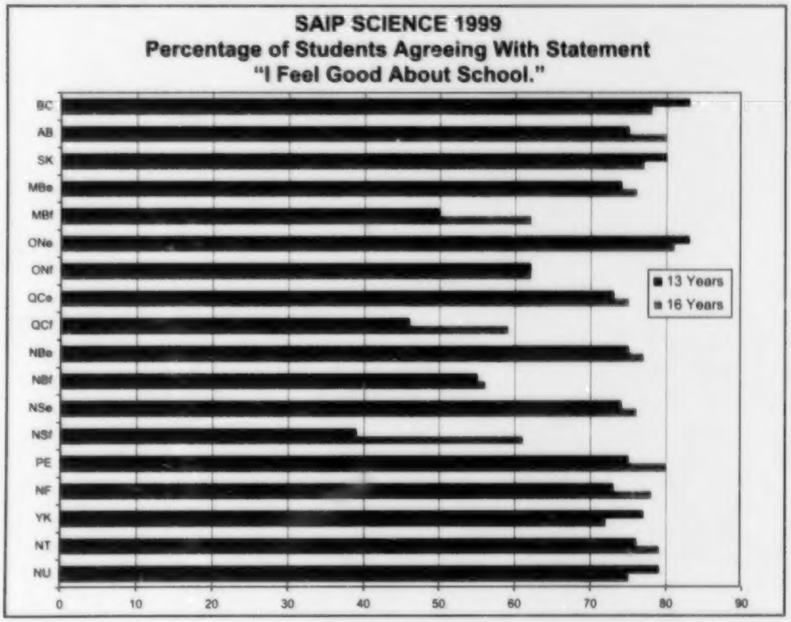


Students with science marks 70 or more

	13 Years %	16 Years %
BC	66	56
AB	54	44
SK	68	58
MBe	58	48
MBf	64	57
ONe	64	45
ONf	62	48
QCe	60	45
QCf	57	44
NBe	68	49
NBf	67	46
NSe	68	59
NSf	67	59
PE	74	60
NF	61	52
YK	49	47
NT	54	29
NU	46	27

Chart 81

How do you feel about the statement "I feel good about school."

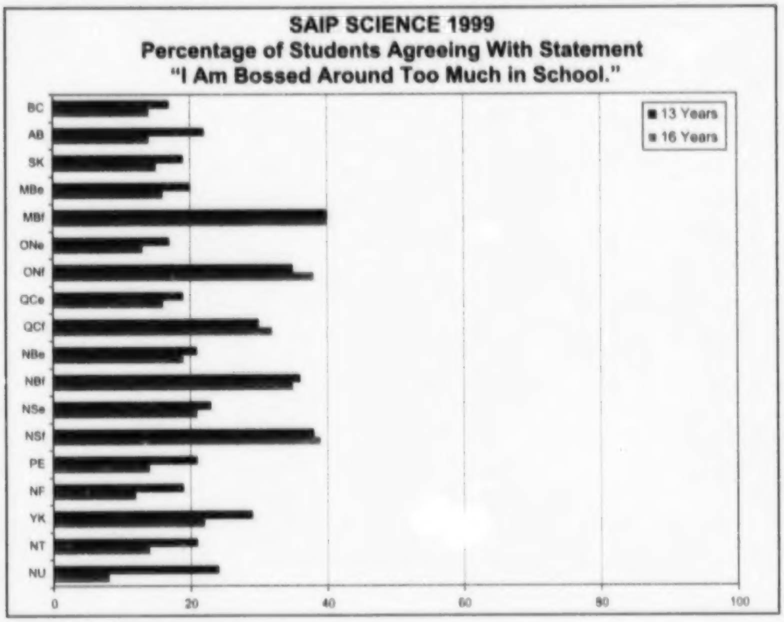


Students who feel good about school

	13 Years %	16 Years %
BC	83	78
AB	75	80
SK	80	77
MBe	74	76
MBf	50	62
ONe	83	81
ONf	62	62
QCe	73	75
QCf	46	59
NBe	75	77
NBf	55	56
NSe	74	76
NSf	39	61
PE	75	80
NF	73	78
YK	77	72
NT	76	79
NU	79	75

Chart 82

How do you feel about the statement "I am bossed around too much in school."

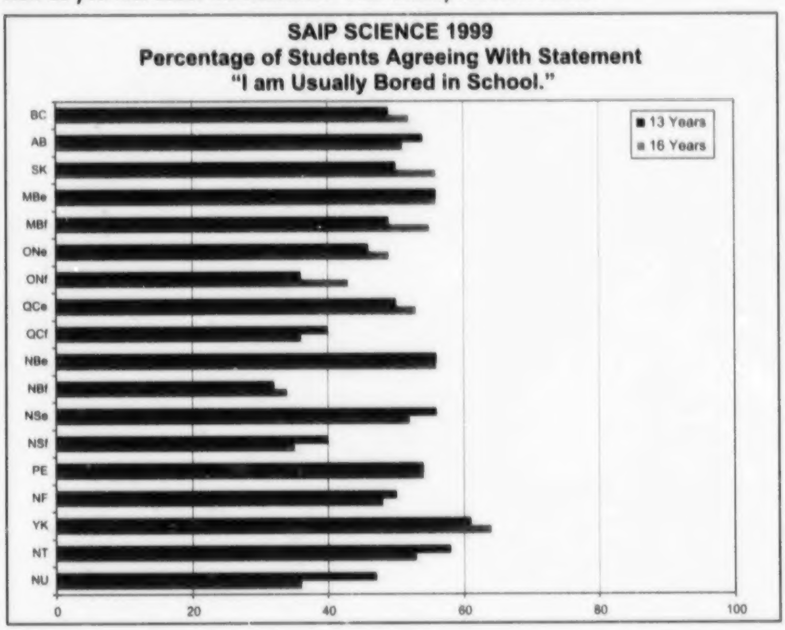


Students who feel bossed around

	13 Years %	*16 Years* %
BC	17	14
AB	22	14
SK	19	15
MBe	20	16
MBf	40	40
ONe	17	13
ONf	35	38
QCe	19	16
QCf	30	32
NBe	21	19
NBf	36	35
NSe	23	21
NSf	38	39
PE	21	14
NF	19	12
YK	29	22
NT	21	14
NU	24	8

Chart 83

How do you feel about the statement "I am usually bored in school."

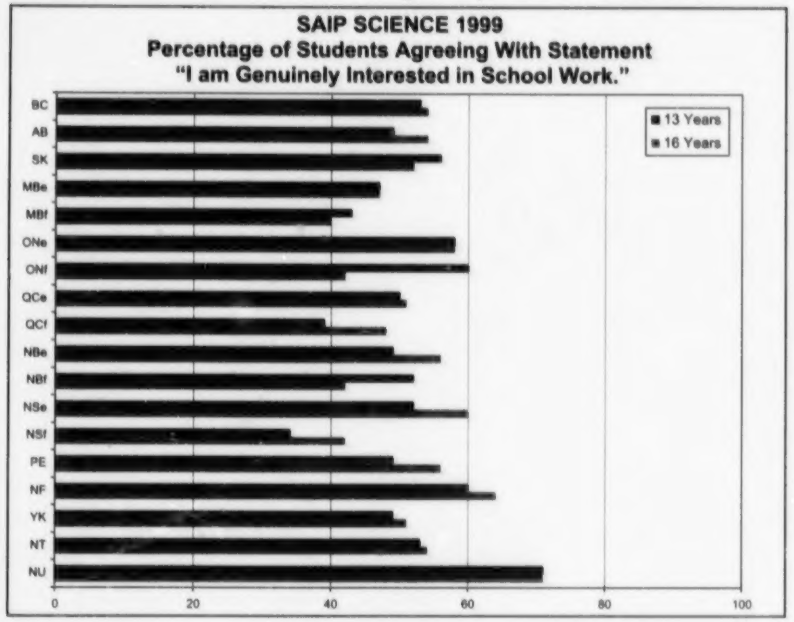


Students bored in school

	13 Years %	*16 Years* %
BC	49	52
AB	54	51
SK	50	56
MBe	56	56
MBf	49	55
ONe	46	49
ONf	36	43
QCe	50	53
QCf	40	36
NBe	56	56
NBf	32	34
NSe	56	52
NSf	40	35
PE	54	54
NF	50	48
YK	61	64
NT	58	53
NU	47	36

Chart 84

How do you feel about the statement "I am genuinely interested in school work."

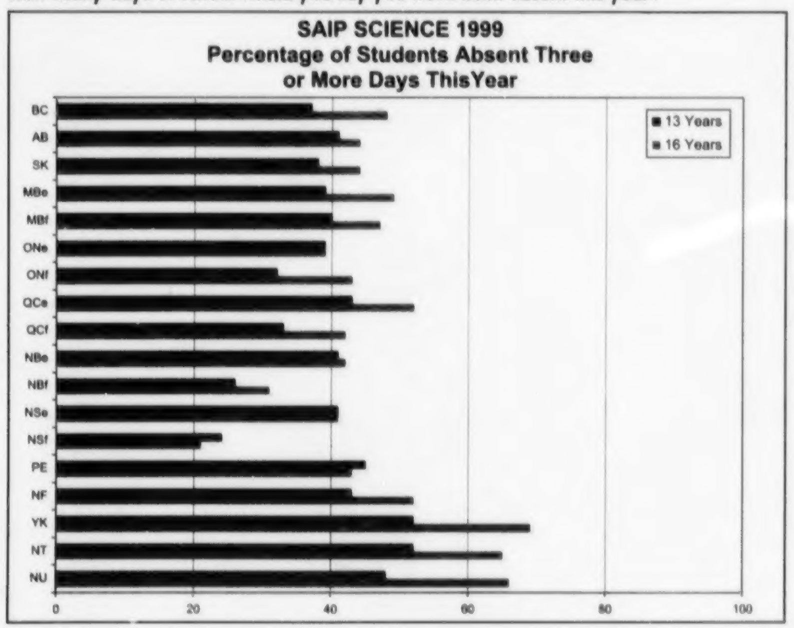


Students genuinely interested

	13 Years %	16 Years %
BC	53	54
AB	49	54
SK	56	52
MBe	47	47
MBf	43	40
ONe	58	58
ONf	60	42
QCe	50	51
QCf	39	48
NBe	49	56
NBf	52	42
NSe	52	60
NSf	34	42
PE	49	56
NF	60	64
YK	49	51
NT	53	54
NU	71	71

Chart 85

How many days of school would you say you have been absent this year?

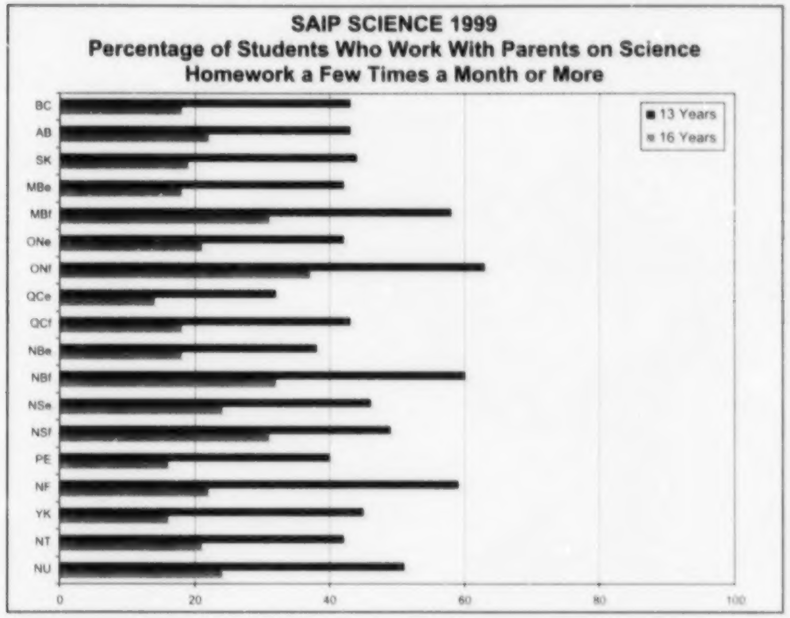


Students absent 3 days or more

	13 Years %	16 Years %
BC	37	48
AB	41	44
SK	38	44
MBe	39	49
MBf	40	47
ONe	39	39
ONf	32	43
QCe	43	52
QCf	33	42
NBe	41	42
NBf	26	31
NSe	41	41
NSf	24	21
PE	45	43
NF	43	52
YK	52	69
NT	52	65
NU	48	66

Chart 86

How often do you and your parent(s) or guardian(s) work together on your science homework?

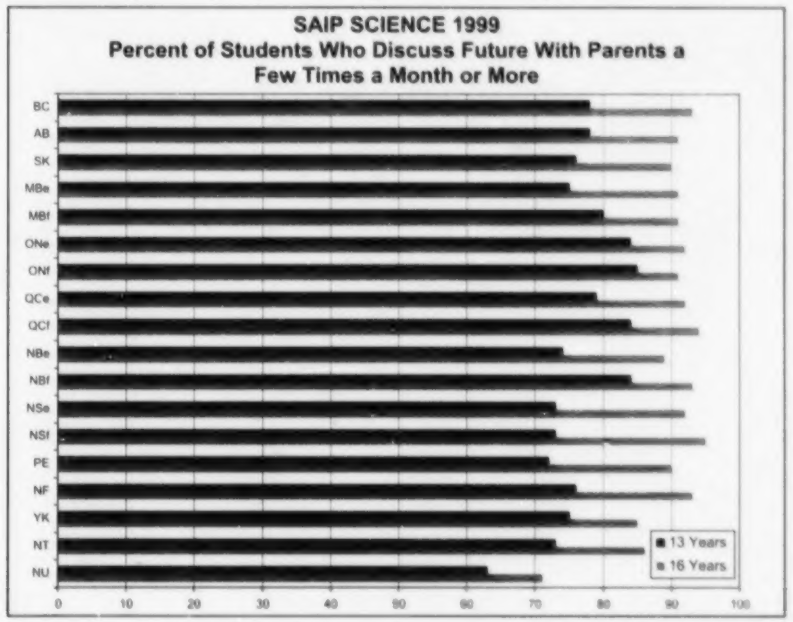


Students who do homework with parents

	13 Years %	16 Years %
BC	43	18
AB	43	22
SK	44	19
MBe	42	18
MBf	58	31
ONe	42	21
ONf	63	37
QCe	32	14
QCf	43	18
NBe	38	18
NBf	60	32
NSe	46	24
NSf	49	31
PE	40	16
NF	59	22
YK	45	16
NT	42	21
NU	51	24

Chart 87

How often do you and your parent(s) or guardian(s) discuss your future?

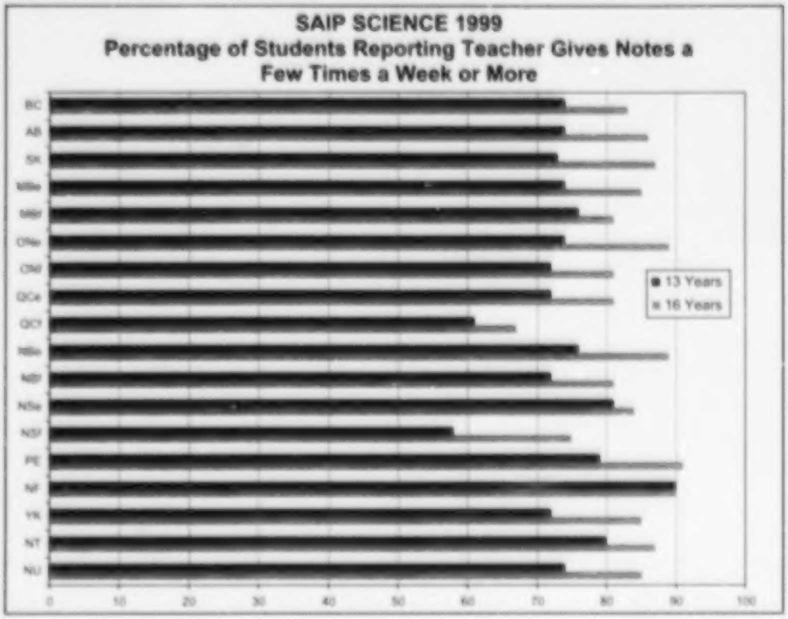


Students who discuss future with parents

	13 Years %	16 Years %
BC	78	93
AB	78	91
SK	76	90
MBe	75	91
MBf	80	91
ONe	84	92
ONf	85	91
QCe	79	92
QCf	84	94
NBe	74	89
NBf	84	93
NSe	73	92
NSf	73	95
PE	72	90
NF	76	93
YK	75	85
NT	73	86
NU	63	71

Chart 88

In this course, how often does the teacher gives notes?

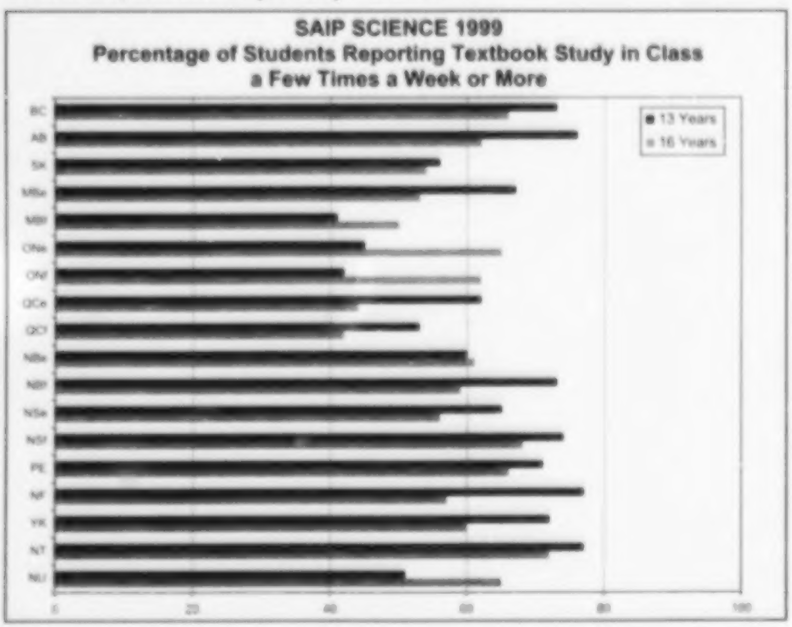


Teacher gives notes

	13 Years %	16 Years %
BC	74	83
AB	74	86
SK	73	87
MBe	74	85
MBf	76	81
ONe	74	89
ONf	72	81
QCe	72	81
QCf	61	67
NBe	76	89
NBf	72	81
NSe	81	84
NSf	58	75
PE	79	91
NF	90	90
YK	72	85
NT	80	87
NU	74	85

Chart 89

In this course, how often do you study the textbook?

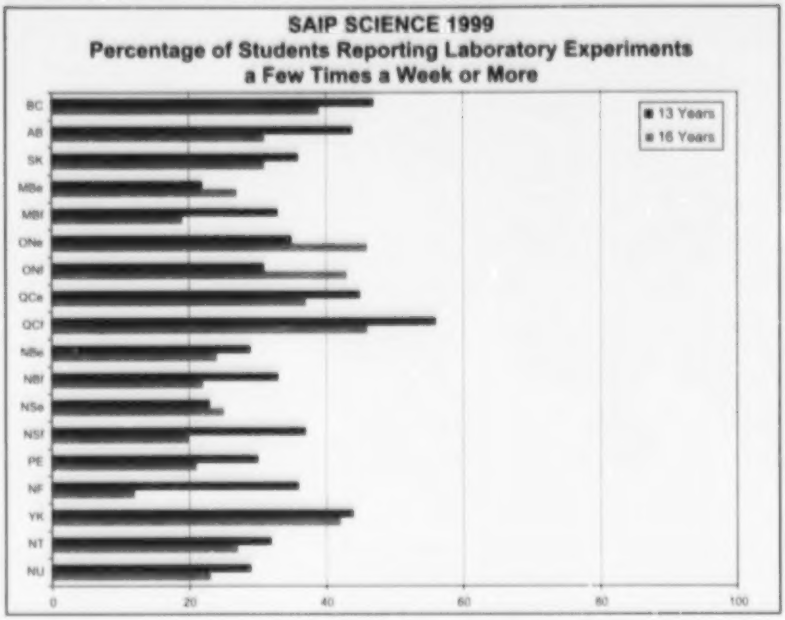


Use of textbooks

	13 Years %	16 Years %
BC	73	66
AB	76	62
SK	56	54
MBe	67	53
MBf	41	50
ONe	45	65
ONf	42	62
QCe	62	44
QCf	53	42
NBe	60	61
NBf	73	59
NSe	65	56
NSf	74	68
PE	71	66
NF	77	57
YK	72	60
NT	77	72
NU	51	65

Chart 90

In this course, how often do you do laboratory experiments?

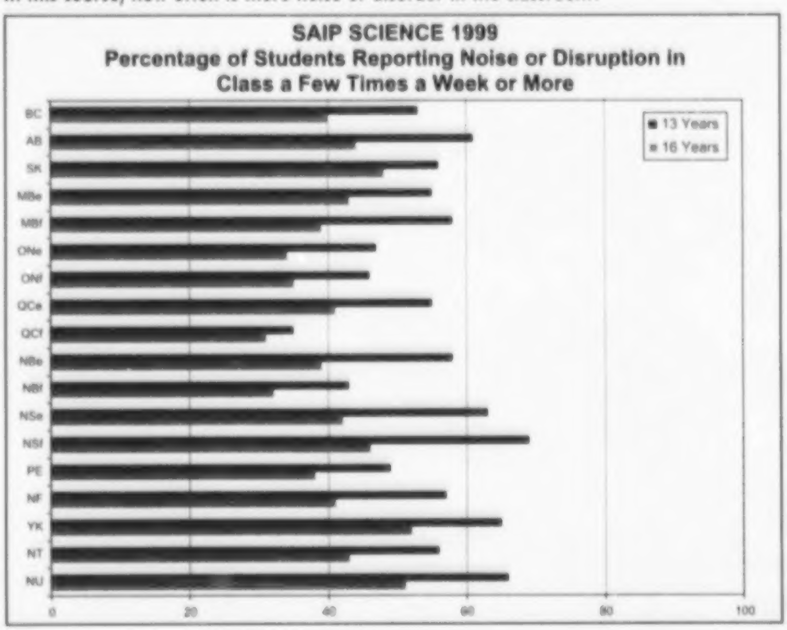


Use of laboratory experiments

	13 Years %	*16 Years* %
BC	47	39
AB	44	31
SK	36	31
MBe	22	27
MBf	33	19
ONe	35	46
ONf	31	43
QCe	45	37
QCf	56	46
NBe	29	24
NBf	33	22
NSe	23	25
NSf	37	20
PE	30	21
NF	36	12
YK	44	42
NT	32	27
NU	29	23

Chart 91

In this course, how often is there noise or disorder in the classroom?

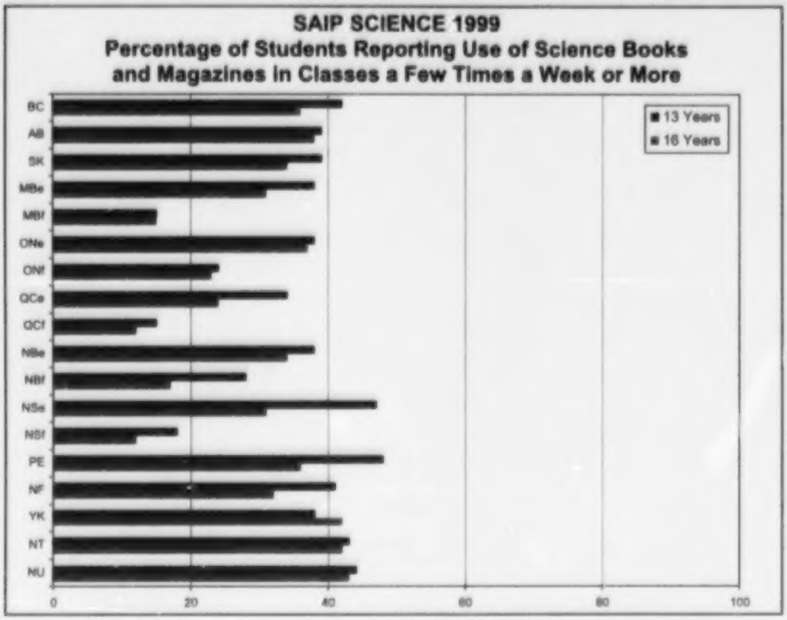


Presence of noise or disruption

	13 Years %	*16 Years* %
BC	53	40
AB	61	44
SK	56	48
MBe	55	43
MBf	58	39
ONe	47	34
ONf	46	35
QCe	55	41
QCf	35	31
NBe	58	39
NBf	43	32
NSe	63	42
NSf	69	46
PE	49	38
NF	57	41
YK	65	52
NT	56	43
NU	66	51

Chart 92

How often are science books and magazines (other than textbooks) used in this science course?

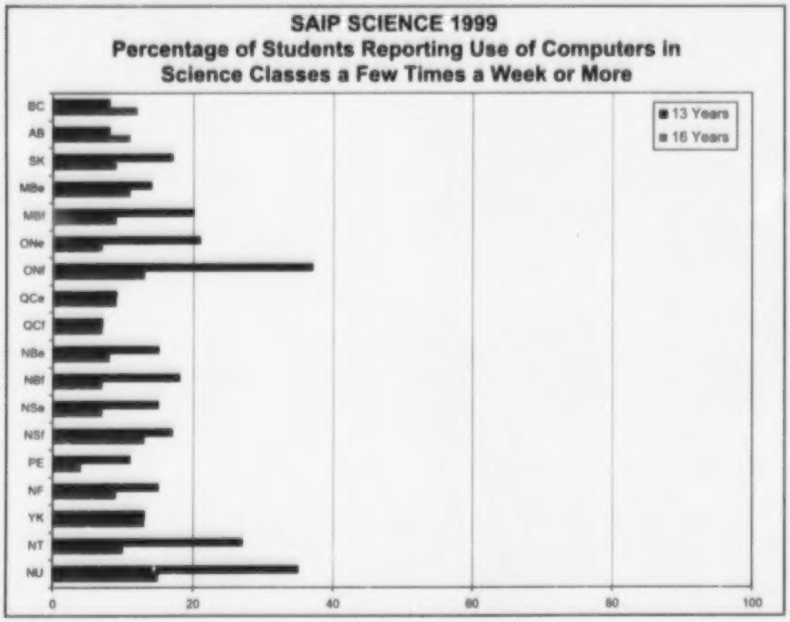


Use of books and magazines

	13 Years %	*16 Years* %
BC	42	36
AB	39	38
SK	39	34
MBe	38	31
MBf	15	15
ONe	38	37
ONf	24	23
QCe	34	24
QCf	15	12
NBe	38	34
NBf	28	17
NSe	47	31
NSf	18	12
PE	48	36
NF	41	32
YK	38	42
NT	43	42
NU	44	43

Chart 93

How often are computers used in this science course?

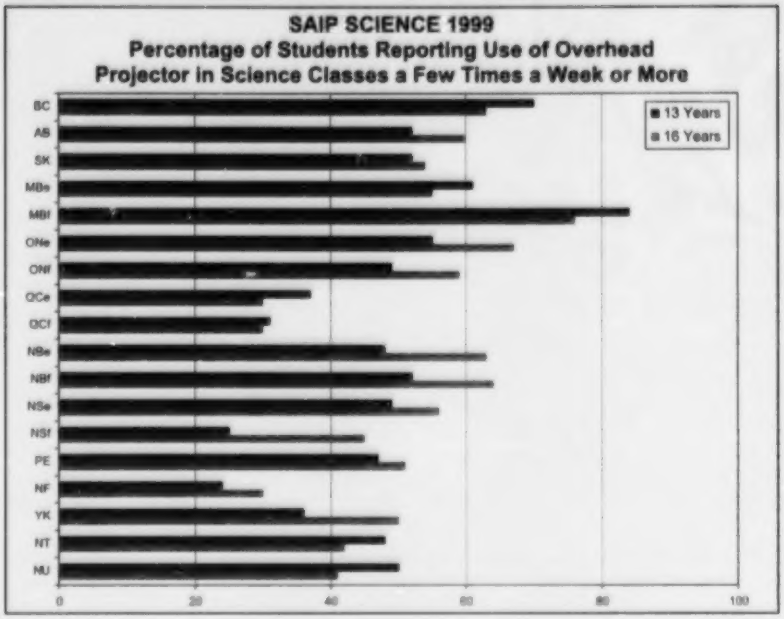


Use of computers

	13 Years %	*16 Years* %
BC	8	12
AB	8	11
SK	17	9
MBe	14	11
MBf	20	9
ONe	21	7
ONf	37	13
QCe	9	9
QCf	7	7
NBe	15	8
NBf	18	7
NSe	15	7
NSf	17	13
PE	11	4
NF	15	9
YK	13	13
NT	27	10
NU	35	15

Chart 94

How often is an overhead projector used in this science course?



Use of overhead projector

	13 Years %	*16 Years* %
BC	70	63
AB	52	60
SK	52	54
MBe	61	55
MBf	84	76
ONe	55	67
ONf	49	59
QCe	37	30
QCf	31	30
NBe	48	63
NBf	52	64
NSe	49	56
NSf	25	45
PE	47	51
NF	24	30
YK	36	50
NT	48	42
NU	50	41

CONCLUSIONS

The 1999 Science Assessment marked another milestone in the School Achievement Indicators Program. This was the first time that comprehensive data had been gathered on the context for learning, thus allowing SAIP to approach more closely its original formulation as a comprehensive educational indicators program.

This report examines some of the highlights of the data gathered from principal, teacher, and student questionnaires, covering a greater variety of variables than might be expected to be associated with science learning. These variables were based on a conceptual framework developed from an initial Input→Process→Outcome model of learning and an elaboration of this model derived from a comprehensive synthesis of research conducted by Wang, Haertel, and Walberg (1993). Specifically, items were included under seven major categories:

1. the provincial/district context, e.g., size, autonomy, resource allocation
2. the out-of-school context, e.g., community size and type, home environment, home language
3. the school context, e.g., structure and size, leadership style, policies, programs
4. student characteristics, e.g., aspirations, attributions of success/failure, importance of school and science
5. program design, e.g., implemented curriculum, lesson planning, materials use
6. teacher characteristics, e.g., qualifications, experience, views on science and science teaching
7. classroom instruction and climate, e.g., classroom routines, use of time, classroom climate, homework

This report is confined to summarizing responses to the questionnaires across the various SAIP populations. This descriptive approach serves to highlight how the context of learning differs among the various educational jurisdictions across the country. Differences between the two official language groups are also highlighted as an adjunct to the cross-jurisdiction analysis because SAIP has identified separate populations for the two language groups in several jurisdictions. In addition, age differences could be identified for the student questionnaires because the student populations were separated by age. Other interesting breakdowns, such as by gender or socioeconomic status, were not pursued here, as these were not explicitly part of the populations definitions. However, data were collected on these variables, and such breakdowns can be pursued in subsequent analyses. More important, no correlations with achievement have been reported, as a much more detailed analysis would be required to do an adequate job of examining these relationships.

The following are highlights of the major results:

1. As might be expected, school sizes tend to follow provincial populations, with larger provinces having larger school sizes. However, district sizes appear to be more closely related to recent developments in district consolidation than to provincial population.
2. In most jurisdictions except Nunavut, most children speak the same language at home as the language of the school. The proportion speaking a different language at home is much larger in minority-language than in majority-language schools. This crossing of official language groups is more prevalent than the existence of immigrant language groups as a source of language difference between school and home.
3. Average class sizes tend to be in the 20–25 range but vary substantially across jurisdictions. Classes for 13-year-olds tend to be slightly larger than for 16-year-olds.
4. Decisions on teacher hiring are influenced mainly by districts and principals, with the relative influence of each varying considerably by jurisdiction. Decisions on choice of textbooks are influenced mainly by the province in Eastern Canada and by internal school sources in Central and Western Canada. Other areas of decision making, such as discipline, course offerings, and absenteeism were influenced primarily from within the school.
5. Levels of parental involvement in aspects of school life were generally reported by principals as low, with some variation across jurisdictions. Community conditions, lack of parental support, student ability, and home background are more prevalent as factors limiting instruction in francophone schools and schools in the territories than in other anglophone schools. Shortage of science teachers and shortage of other specialists were more prevalent as limiting factors in schools in the Eastern and Western provinces and in the territories, with Quebec francophone schools reporting the lowest limitations.
6. Most schools reported having substantial numbers of computers, with a high ratio of up-to-date (defined as computers capable of running Windows™-based programs and Web browsers) to total computers. The number of computers for teacher and student use is substantially less than the total, suggesting that many

computers are dedicated to administrative use. Generally, more than half the schools reported that a shortage of computers limits instruction, a problem that was less evident in Quebec and the territories than elsewhere.

7. Schools are generally not streamed or ability-grouped for 13-year-old students. However, streaming is much more prevalent at the 16-year-old level. Wide variations in the occurrence of streaming are found across jurisdictions. An overall majority of both principals and teachers support streaming for high school students. Again, however, there are substantial jurisdictional variations, with a tendency for support to be correlated with the actual incidence of streaming.
8. About 60% of teachers overall are female, with relatively small variations across jurisdictions. Most teachers tend to be in mid-career, with those in the Quebec anglophone system standing out as having substantially more experience and those in the territories less experience than teachers elsewhere. Almost all teachers hold full-time positions.
9. Almost all teachers hold university degrees, with the B.Ed. being most common. The proportion of teachers specialized in science, as evidenced by the B.Sc. degree or equivalent, varies widely across jurisdictions. Relatively few teachers — less than 10% in most jurisdictions — hold master's degrees. A notable exception is the Quebec anglophone system, where more than 20% of teachers hold the advanced degree.
10. The level of teachers' involvement with parents is characterized by wide variations across jurisdictions. Teachers in anglophone jurisdictions tend to have greater contact with parents than their francophone counterparts. The main source of contact is parent-teacher interviews.
11. Lesson planning seems most often to consist of teachers working alone with their own previously prepared materials. Other text or resource materials are used relatively rarely. The use of provincial curriculum guides is less prevalent in Quebec, whether anglophone or francophone, and more prevalent in Newfoundland and Labrador than elsewhere.
12. Computers and the Internet are not in common use as lesson preparation tools, with only about 15% of teachers reporting frequent use.
13. There was general agreement between teacher and student reports on classroom activities. The most common activities during class sessions were reported as note giving, showing students how to do problems, diagnosing individual student problems or weaknesses, students working alone on assigned work, and the teacher working with individual students. The use of science books and magazines varies widely between language groups, with francophone teachers and students both reporting much less use than their anglophone counterparts.
14. The frequency of laboratory activities in science was variable across jurisdictions, with a pattern of more laboratory activities in the three Western provinces and among both language groups in Ontario and Quebec.
15. Questioning is a highly prevalent classroom activity throughout, with the most common form being teacher questions requiring brief responses.
16. Far more teachers agree that science is better thought of as a process than as primarily a body of knowledge and concepts.
17. Almost all teachers support the proposition that students need to work hard to do well in science, but relatively few agree that success in science requires natural talent.
18. The percentage of students born outside of Canada is quite small in most jurisdictions, averaging less than 5%. As expected, British Columbia, Ontario English, and Quebec English reported substantially greater proportions of immigrant students.
19. Generally, more parents of students in the Eastern provinces and in Nunavut have less than a high school education than those elsewhere. In particular, a greater proportion of fathers in these jurisdictions was reported as having less than high school completion. The picture for parents as university graduates was more mixed, with no clear geographical or language pattern and little difference between the proportions of fathers and mothers in this category.
20. A majority of students in all jurisdictions except Nunavut reported having a computer in their home, with the figures ranging up to 80% or more in many jurisdictions. The proportions having Internet connections are smaller, but followed the same pattern as for computer possession.

21. Students have relatively high educational aspirations, with more than 90% indicating that they intend to continue their education beyond high school — and with little variation across jurisdictions. The most common projected postsecondary destination among 16-year-olds is university. (Thirteen-year-olds were not counted here because of the large proportion of "don't know" responses.) However, the proportions planning university compared to trades/technical studies vary across jurisdictions and language groups, with francophone students generally showing lower levels of university aspiration and higher levels of trades/technical aspiration than anglophone students.

22. About half of 16-year-olds plan careers in fields related to science and technology, with relatively small variations across jurisdictions. The most common field reported was health, followed by pure science, engineering, and computer studies. Science or mathematics teaching was reported as a career destination by less than 3% of students overall.

23. A high proportion of students agree that their parents think it is important for them to do well in school. This proportion drops considerably when the question was on the importance of doing well in science. Age and language differences are apparent for these questions, with francophone parents and parents of 16-year-olds being perceived by their children as less concerned about their doing well in science. The language difference is also apparent for student perceptions of whether their teachers think it is important for them to do well in both school and science, again with francophone students feeling that their teachers place less importance on their doing well. Interestingly, an opposite language effect was found for student self-perceptions, with francophones reporting higher levels of agreement than anglophones that it is important to do well in both school and science.

24. Generally, less than half the students reported doing one hour or more of science homework per week. The proportions were much higher, however, for homework in other subjects combined. Generally, fewer francophone than anglophone students and fewer 13-year-olds than 16-year-olds reported the higher homework times.

25. About half the students agree that science is more difficult than other subjects, with higher levels of 16- than 13-year-olds holding this view. In anglophone jurisdictions, more than 80% of students agree that science is an important school subject and that many good jobs require the study of science. The comparable figures for students in francophone jurisdictions are much lower — generally at 50% or less.

26. The language difference persists for the proposition that natural ability is required to do well in science. Here, francophone students are much less likely than anglophones to support the proposition. In addition, more francophone than anglophone students attribute getting a high mark to good luck.

27. In general, anglophone students hold more positive views than francophone students on the quality of school life. Fewer francophones than anglophones report feeling good about school and being genuinely interested in school work. In addition, more francophones agree that they are bossed around too much in school. An exception to this pattern occurs in responses to the statement "I am usually bored in school" — with more anglophones than francophones agreeing with this statement.

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APPENDIX

FRAMEWORK FOR THE QUESTIONNAIRES

Conceptual Framework

It is obvious that learning is a complex process and that the achievement of an individual student or group of students is influenced by an enormous number of variables. While some of the important influences on achievement are related to ability and socioeconomic status, which are beyond the control of the school, it is also generally acknowledged that variations in educational policies and practices can also affect learning. In fact, the latter understanding, coupled with a strong belief in the importance of education for individual and societal well-being, forms the main justification for an enormous investment of public funds in education.

The fact that learning is complex does not mean it cannot be analysed. Some of the many influences on learning would be expected to be more important for policy, more amenable to change, or more efficient as ways of enhancing learning than others. Improving learning can be expected to require intervention at the individual student, classroom, school, or jurisdictional level. Some ways of making these improvements might require enormous outlays of resources, while others might be accomplished relatively easily. Analysis of the relative influence of background variables should be expected to yield insights into the possible effects of changes in policies and practices.

Most educational indicator systems are built upon the fairly straightforward concept that student learning outcomes are influenced by inputs and by the processes engendered by these inputs. It is also generally recognized that education operates in an overall context determined by demographic features, social and economic conditions, infrastructure, and other broad characteristics of the society in which the enterprise operates. This type of model is depicted in Figure 1.

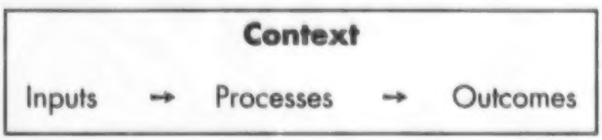

Figure 1
Input-Process-Outcome Model in Context

While outcomes, in a program such as SAIP, are clearly defined as the results derived from the achievement measures, the model, in itself, does not tell us what specific context, input, or process variables are most worth investigating. Some elaboration of the model is required to determine which variables should be included in studies of the factors influencing achievement.

Most of the variables included in comprehensive surveys have some plausible basis in previous research, or their inclusion may be justified by their policy relevance. Perhaps the best example of this is the synthesis work of Herbert Walberg and his colleagues, which has taken place over more than a decade and which has appeared in the literature in various forms. The particular version to be discussed here appears in three major articles by Wang, Haertel, and Walberg (1990, 1993, 1994).

In their 1993 paper, Wang, Haertel, and Walberg synthesized the results of more than 200 research reviews, encompassing thousands of individual studies. They identified 228 variables shown to be associated with learning. These, in turn, were organized into 30 scales, under six broad categories on a proximal/distal continuum based on how closely the variable touched on the lives of teachers and students in the classroom. For example, broad state and school district policies were considered the most distal variables, while time on task, discipline, and other classroom variables were considered most proximal.

In general, the results supported the hypothesis that proximal variables are more closely associated with learning than more distal variables. The order of influence of the six main categories was as follows:

1. program design (e.g., curriculum and instruction)
2. out-of-school contextual variables (e.g., home environment, out-of-school use of time)
3. classroom instruction and climate (e.g., classroom management)
4. student variables (e.g., motivation, placement)
5. school-level variables (e.g., parent-involvement policy)
6. state and district variables (e.g., state-level policy)

In a subsequent report, Wang, Haertel, and Walberg (1994) refined the model slightly and produced composite ratings for 28 of the original 30 scales. From this analysis, it was possible to identify the specific scales that showed the strongest and weakest associations with learning. The five strongest were these:

1. classroom management
2. metacognitive processes

3. cognitive processes
4. home environment/parental support
5. student-teacher social interactions

Motivation, peer-group influences, quantity of instruction, classroom climate, and other proximal variables also received high rankings.

The scales showing the smallest influences on learning were

1. district demographics
2. school policies
3. state-level policies
4. school demographics
5. program demographics

This review is by far the most comprehensive attempt to synthesize the research on variables associated with learning. Nevertheless, there are limitations even to this review. From a Canadian perspective, an obvious limitation is the overwhelming influence of American research and American perspectives on reviews of this type. While less obvious in the work of Wang et al. than in other cases, much of this work is motivated and supported by what is widely regarded as a crisis in education in the United States and the initiatives being taken to extricate the nation from this crisis. While there is no way of avoiding this in comprehensive reviews, it is not obvious that the same relationships would be found if a similar body of work could be found in Canada or other parts of the world.

A second and related point is that little of the review literature used in the synthesis was based on large-scale surveys, using comprehensive sampling and data collection. Until recently, the only such studies available were those sponsored by IEA, of which the TIMSS study mentioned earlier is the most recent example. As more studies such as this are being initiated, especially at the international level, our knowledge of the influences on learning is likely to increase rapidly. The current generation of large-scale assessments in a number of countries is making available data on much larger and more representative samples, and on many more variables, than was the case for most earlier research. Studies such as SAIP can contribute to this knowledge building. In particular, SAIP and other similar studies in other countries have great potential because of their comprehensive sampling schemes, high participation rates, and generally high-quality measures.

Questionnaire Specifications

An initial table of specifications for the questionnaires was developed from the Wang, Haertel, and Walberg synthesis, as well as from an initial analysis of policy issues in the Canadian context and an examination of the frameworks for several other large-scale studies. These included earlier SAIP student questionnaires, the Third International Mathematics and Science Study (TIMSS), the National Longitudinal Study of Children and Youth (NLSCY) being conducted by Statistics Canada, and the early drafts of a framework and questionnaires for the OECD Programme for International Student Assessment (PISA). This table was organized along the lines of the six main categories of the Wang, Haertel, and Walberg synthesis and also included a teacher-level, which captured certain policy-relevant issues, such as teacher qualifications. (These are present in other formulations but absent as a main category in Wang, Haertel, and Walberg.) The main categories and second-level subcategories are as follows:

1 Provincial/District Context

1.1 Administrative autonomy
1.2 Bureaucratic structure
1.3 District size
1.4 Control of curriculum
1.5 Resource allocation
1.6 External testing

2 Out-of-School Context

2.1 Community type
2.2 Community support of school
2.3 Home environment
2.4 Parental support
2.5 Peer group
2.6 Use of out-of-school time
2.7 Parent education
2.8 Home language

3 School

3.1 School structure
3.2 School size
3.3 Leadership style
3.4 School improvement effort
3.5 Staff morale/collaboration
3.6 Discipline policy
3.7 Evaluation policy
3.8 Resources
3.9 Staff deployment
3.10 Parent involvement
3.11 Program differentiation

4 **Student**
- 4.1 Prior performance
- 4.2 Aspirations
- 4.3 Performance expectations
- 4.4 Attributions of success/failure
- 4.5 Importance of science
- 4.6 Liking for school
- 4.7 Liking for science
- 4.8 Learning strategies (metacognition)
- 4.9 Time on task
- 4.10 Peer interaction
- 4.11 Behaviour
- 4.12 Absenteeism
- 4.13 Stream

5 **Program Design**
- 5.1 Curriculum prescription
- 5.2 Curriculum support
- 5.3 Implemented curriculum
- 5.4 Opportunity to learn
- 5.5 Teacher-designed material
- 5.6 Lesson planning
- 5.7 Materials selection and use

6 **Teacher**
- 6.1 Basic teacher qualifications
- 6.2 Teacher specialization
- 6.3 Experience
- 6.4 Professional development
- 6.5 Confidence
- 6.6 Attributions of responsibility
- 6.7 Professional status
- 6.8 Requirements for science teaching
- 6.9 Nature of science and science teaching
- 6.10 Pedagogical beliefs

7 **Classroom Instruction and Climate**
- 7.1 Classroom routines
- 7.2 Direct instruction
- 7.3 Grouping
- 7.4 Active participation
- 7.5 Laboratory activities
- 7.6 Seatwork
- 7.7 Monitoring/piloting
- 7.8 Total scheduled time
- 7.9 Instructional time lost
- 7.10 Disruptive behaviour
- 7.11 Recitation
- 7.12 Classroom climate
- 7.13 Homework

Development Procedures

The initial draft of the three questionnaires was produced directly from the table of specifications. Many items were adapted from previous studies. Other items were constructed specifically to fit the table of specifications. This draft was reviewed in detail by the members of the SAIP developmental consortium, and the draft teacher questionnaire was also reviewed by approximately 20 teachers. The draft student questionnaire was subjected to a field trial in one province, using 24 classes, with a total of 535 students.

All the information from the reviews and field trials was used to produce a second draft. After one further review by the developmental consortium, the new draft was submitted to the various jurisdictions, through the SAIP coordinators in each jurisdiction. This was a crucial stage in the process because individual provinces and territories had final authority over whether or not the instruments would be administered in schools within their jurisdiction. Because of the fairly high demands placed on teachers, both in administering the tests and in completing the questionnaires, it was also judged desirable to consult the Canadian Teachers' Federation (CTF) to ensure support from the national body representing teachers. Detailed written submissions were received from a number of provinces and from CTF. Personnel from other jurisdictions had an opportunity to react in a conference call on March 5, 1999, during which an item-by-item review of all three questionnaires was conducted.

These reviews resulted in extensive modifications to the questionnaires. The most significant changes involved items on student socioeconomic status and family circumstances, teacher background, and school climate. Nevertheless, core items on student socioeconomic status (parents' education and occupations) and on teacher qualifications and experience were retained. Items on the school questionnaire concerning behaviour problems were removed. However, it was possible to retain more general items on school climate, such as levels of responsibility for various activities, the role of parents, and the existence of policies governing discipline, homework, and similar matters.

Because of the extensiveness of the last round of revisions, it was expected that some discrepancies would arise between

the original table of specifications and the final forms of the questionnaires. For this reason, the final drafts were again compared to the original specifications. Despite the extensive changes, only a small number of the original categories were excluded in the final version of the questionnaires. The main omissions were as follows:

1. Categories 1.2 (bureaucratic structure), 1.5 (resource allocation), and 1.6 (external testing). For the first two of these, it was judged that the information would not be available at the school level. The last item (external testing) is generally a provincial responsibility, and the state of external examinations is known for each jurisdiction.
2. Categories 4.10 (peer interaction) and 4.11 (behaviour) were omitted from the student questionnaire because of the potential sensitivity of items on these matters.
3. Categories 5.1 (curriculum prescription) and 5.2 (curriculum support) were excluded from the teacher questionnaire because the SAIP test is not curriculum-specific, and it was therefore judged more appropriate to ask teachers about coverage of content specific to the test.
4. Category 6.4 (teacher professional development) was initially omitted because of an oversight. By the time this was detected, concerns with the length of the questionnaire led to the judgment that further items should not be added.
5. Category 6.7 (teacher professional status) was excluded because of concerns about sensitivity of items in this area.
6. Category 7.12 (classroom climate) was excluded because of sensitivity and because a complex scale would have been required on both teacher and student questionnaires to adequately address this area.

A few items in the questionnaires were not included in the table of specifications. Such items were mainly intended to provide basic demographic data or were included for descriptive purposes. One item, dealing with teacher workload, was considered of sufficient policy interest to justify inclusion, even though it was not part of the model from which the table of specifications was derived.

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